

Size frequency distribution of red snapper from dockside sampling of commercial landings in the Gulf of Mexico 1984-2002 (TIP size data)

by

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Size frequency distributions of red snapper were analyzed from commercial landings sampled by the Trip Interview Program (TIP) from 1984 to 2003. Red snapper are primarily caught using handlines operated either manually or with electric or hydraulic reels. Landings from these gears were analyzed as one gear group: 'handline gear' (HL). The second major gears are the bottom longlines and buoys referenced in this document as 'longline gear' (LL).

We did not take into account the TIP 'bias code' and 'quota sampled code' in any of the present analysis. The 'bias code' indicates a trip bias (i.e., size bias), while the 'quota sample' refers to non-randomly selected sampled from the landings. Both codes were not used consistently by port agents.

Table 1 shows the total number of trips sampled by TIP by year and gear. Eighty four percent (84%) of all trips sampled corresponded to HL and 15% to LL (0.9% corresponded to unknown gear category).

The present document was prepared with TIP data available as March 24 2004. Additional TIP data for the state of TX was made available after that date but it was not included in the present analyses.

Table 1: Number of trips sampled by TIP by gear category from 1984 to 2003.

YEAR	GEAR		
	HL	LL	Unknown
1984	99	51	2
1985	150	63	14
1986	103	109	7
1987	92	45	
1988	81	26	
1989	86	18	3
1990	292	60	4
1991	313	46	3
1992	281	35	2
1993	301	41	1
1994	340	28	6
1995	218	35	
1996	211	23	
1997	281	13	1
1998	361	33	3
1999	377	58	2
2000	348	60	4
2001	375	52	3
2002	437	74	1
2003	361	61	2
TOTAL	5,107	931	58

A total of 174,185 red snapper were sampled by TIP from 1984 to 2002. Of these, 93.3% (162,573 fish) were caught with HL, 5.6% (9,814 fish) with LL, and 1% (1,798 fish) were harvested with unknown gear. Size frequency distributions were prepared only from records where fishing area was recorded (Table 2). The percentage of sampled fish in the TIP data set with known harvest location varied by year (Table 3). Previous assessments divided the Gulf of Mexico into a west and east areas using the 88° W meridian. This meridian corresponds to the boundary between statistical areas 10 and 11 (Figure 1) and the boundary between Mobile and Baldwin counties in the state of Alabama. County of landing was not used as a proxy for fishing area for those records where harvest location was unknown. We use a sub sample of the TIP data where the total red snapper landings were known to estimate the proportion (by weight) of red snapper sampled (Table 4). Higher percentages of the landings were sampled on the east GOM compared to the west probably as result of the smaller landings in this region. Similarly, a higher percentage of the catches from LL was sampled compared to HL.

Table 2: Number of red snapper sampled by TIP by gear category from trips with known fishing area 1984-2002.

YEAR	GEAR		
	HL	LL	Unknown
1984	4,003	953	1
1985	2,091	506	13
1986	2,016	252	32
1987	1,177	139	
1988	1,207	144	
1989	1,682	225	32
1990	8,570	573	11
1991	6,933	152	19
1992	7,910	205	23
1993	8,917	193	10
1994	7,392	103	1
1995	8,104	207	
1996	10,54	87	
1997	12,45	131	15
1998	13,32	462	31
1999	8,499	363	27
2000	7,680	660	34
2001	8,848	410	27
2002	10,43	817	2
TOTAL	131,7	6,582	278

Table 3: Percentage of fish in the TIP data set with known and unknown fishing area and total number caught by year from catches where gear type was reported. For example, in 1984 a total of 6,921 fish were sampled of which only 71.6% (4,956) were from trips where fishing area was reported. Those 4,956 fish correspond to the number of fish sampled in 1984 from LL and HL gears combined (see Table 3).

Year	% unknown	% known	Total
1984	28.4	71.6	6,921
1985	57.3	42.7	6,085
1986	49.3	50.7	4,473
1987	37.6	62.4	2,109
1988	28.2	71.8	1,881
1989	24.8	75.2	2,535
1990	17.4	82.6	11,073
1991	40.2	59.8	11,851
1992	32.3	67.7	11,990
1993	18.7	81.3	11,210
1994	28.4	71.6	10,462
1995	6.5	93.5	8,891
1996	2.7	97.3	10,925
1997	9.9	90.1	13,959
1998	9.5	90.5	15,225
1999	20.8	79.2	11,185
2000	12.6	87.4	9,541
2001	7.3	92.7	9,982
2002	6.9	93.1	12,089
TOTAL	19.7	80.3	172,387

Table 4: Percentage of the total red snapper landings sampled by TIP. This percentage was estimated only from trips where the total red snapper landings were known.

Year	GEAR			
	HL		LL	
	West	East	West	East
1984	7.6	66.8	15.7	89.6
1985	10.8	55.4	11.9	91.3
1986	4.5	67.1		95.7
1987	4.5	25.3		94.8
1988	2.7	10.3	23.3	86.7
1989	5.8	16.6	6.6	14.6
1990	13.4	51.3	16.2	59.2
1991	13.6	26.5	28.1	78.7
1992	7.9	5.1	36.5	79.5
1993	10.8	28.6	8.7	68.2
1994	15.0	17.2	77.4	76.7
1995	11.7	31.8	34.3	82.2
1996	12.4	63.3	25.4	70.1
1997	13.4	41.0	34.0	77.1
1998	10.6	37.4	20.3	81.6
1999	7.9	20.7	5.1	61.5
2000	6.0	15.9	15.9	72.2
2001	6.1	13.1	17.1	46.1
2002	5.3	8.0	9.4	36.2

HANDLINE Gear

Geographic effect

Figure 2 shows the size frequency distribution of landings (HL) by year and area (east and west GOM). Sample size corresponding to each year and area for HL gear are presented in Table 5. From 1984 to 1986, larger fish were landed in the East GOM compared to the west. The differences were less prominent from 1986 to 1988. Landings from the east shifted towards smaller fish sizes after 1988 and the size distributions were similar in many years after 1988.

The potential geographic effect on size distribution of red snapper landings was further investigated. Size frequencies distribution by year between the Florida west coast (areas 1-7) and the Florida panhandle (areas 8-10) were compared and are presented in Figure 3. Generally, larger fish were landed in areas 1-7 (combined) than in areas 8-10 (combined).

Table 5: Number of red snapper sampled by TIP in each statistical area by year (gear HL).

Year	AREA																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1984			267	123	105	95		246		64	115		1,504	228	154	270	395	174			263
1985		13	42	42	127	82		167		53	22	38	1,067	104	126		46	101	61		
1986		4	25	56	52	14			3	336	479		401	53	116		199	278			
1987		11	13	14	7	10				5	602	33	329	10	90	28		25			
1988		18		19	2	63		46		43	19	59	546	25	167	75	25	57	26		
1989					9	69		32		174	7	205	577	34	371		41	136	27		
1990		1	9	19	41	255		381		165	885	472	1,376	243	229	420	269	541			2,281
1991		14	3	18				119	15	150	684	130	672	301	120	88	795	203	25		2,016
1992		10	3	3	102	7				197	426		171	693	275	507	211	210	96	55	4,610
1993		12	3	17	12	26		52	137	658	1,042	30	264	1,360	181	147	206	306	274	10	4,170
1994	5	13		18	20	30	3	8	444	1,252	2,006		47	180	33	233	103	104	82	140	2,667
1995	15	10			13	6		91	81	746	1,261		556	542	248	1,955	414	168			1,840
1996			2	33	31	26		147	72	338	1,817	55	689	1,186		1,168	636	436	80		3,795
1997		95	40	30		1	2	137	138	494	587		755	1,747	620	2,787	760	200	260		3,297
1998	1	1	6		34	81		197	530	1,012	950		1,047	1,714	711	3,169	1,095	442	102		1,825
1999	1	28	11	58	192	127	58	300	7	827	1,499		1,646	370	371	1,540	704	415	12		
2000		47		5	27	86	16	429	383	545	1,244		1,435	526	203	1,202	1,066	62		10	
2001		14	2	29	20	116	187	460	496	930	1,293		1,201	782	80	1,352	1,525	178			167
2002		7		37	48	173	76	694	205	2,721	354	99	788	1,505	446	1,448	1,197	266	55	120	199
Total	22	298	426	521	842	1,26	342	3,50	2,51	12,96	15,29	1,12	15,071	11,60	4,54	16,38	9,687	4,30	1,10	335	27,130

Close examination of the size frequency distributions from statistical areas 8-10 (Fig. 4) showed that in general a higher proportion of larger animals are landed in area 11 compared to areas 10 and 9. Similar comparison was made between landings in Texas (areas 18-21) and the northern Gulf (areas 17-13). In those cases, no consistent differences were observed (Fig. 5). Table 5 shows number of red snappers sampled by TIP in each grid cell by year.

Permit type effect

The red snapper fishery operates under two different permit types:

(1) Type 1 permit (2,000 lbs): there are only 139 permits of this type; vessels with Type 1 permits are allowed to land up to 2,000 lbs of red snapper per trip.

(2) Type 2 permit (200 lbs): vessels with Type 2 permits are allowed to land up to 200 lbs of red snapper per trip. It is mostly used by fishers participating in other fisheries, such as vermilion snapper or red grouper, where red snapper are caught as bycatch.

Florida Trip Ticket data was used to estimate the proportion and location of the catches landed under each permit type for the period 1998-2002. Figure 6 shows that all red snapper caught in cells 1-5 and most of the catch in cells 6-8 were harvested under the 200 lbs permit type. Generally, the Florida west coast fishery operates under the 200 lbs permit type, while the Florida panhandle operates under both the 200 and the 2,000 lbs permits. Figure 7 shows the size frequency distribution of red snapper caught under the 2,000 and 200 permit types in statistical areas 8-10 (combined). Catches under the 200 lbs permit seem to have a higher proportion of larger fish compared to the 2,000 lbs permit. But, these differences are not as big as the size frequency differences between the Florida panhandle and the west coast observed in Figure 3. Thus, gear type by itself can not explain the observed differences between these two areas in FL. We assumed that the effect of permit type is negligible compared to the geographic effect. Sample sizes are given in Table 6.

Table 6: number of red snapper landed in FL and sampled by TIP harvested under each permit type from 1998 to 2002 (areas 8-10 combined)

Year	permit 200 lbs	permit 2,000 lbs
1998	500	413
1999	658	172
2000	333	525
2001	292	903
2002	2,230	845

Sample size effect

The effect of 'quota sampling' was not analyzed since approximately only 1% of red snapper were sampled under this regime.

Figure 8 shows the relative size frequency distribution of red snapper from samples with 1-25 and 26-50 fish from all areas combined by year. No major differences in size distributions exist between samples with less and more than 25 fish. Figure 9 shows the relative size frequency distribution of red snapper from samples with 1-10 and 11-30 fish from all areas combined and by year. In general, size distributions from samples with less than 10 fish show a higher proportion of larger fish. This result seems to indicate that these samples are either from a fishery where larger fish are caught or that landings are not randomly sampled. However, a comparison of the total number of fish from samples with less than 10 fish (see values in Fig. 9) and the total number of red snapper sampled (see values in Table 3) would indicate that the potential size bias from small samples is minimal when data are pooled for the entire GOM.

Gear effect

A possible gear effect that could explain the observed size differences in the east was investigated. Manual operated gears (i.e., gears 600, 610, 611, 612) generally operate at shallower depths than electric operated gears (i.e., gears 316, 616) and they are believed to catch smaller fish. Catches from the east by both gears for the periods 1984-88 and 1989-2003 were compared (Fig. 10). In the period 1984-88, catches from electric gear were composed of larger fish than catches from manual gear. These size differences between both gears disappeared after 1988. Table 7 shows the number of fish sampled by TIP that were caught by electric gear in statistical areas 2-10. Although in low numbers, catches by electric gear were consistently sampled in areas 3-6 during the period 1984-2002. In contrast, area 10 showed a large number of red snapper sampled only from 1993 to 2001. Figure 11 shows the size frequency distribution of catches in areas 3 to 6 for 1984-88 and 1989-2002. Catches with electric gear during 1984-88 were composed of bigger fish than catches from the period 1989-2003. The reason of this shift in sizes is unclear and probably was a response to changes in the way the fishery operated before and after 1988.

Table 7: Number of red snapper sampled caught with electric handline gear by year in areas 1-10

Year	AREA									
	2	3	4	5	6	7	8	9	10	
1984		267	123	105	76		147			
1985	13	42	42	127	82		167			33
1986	4	25	4	52	14			3		13
1987	11	13	12	7						5
1988	18		19	2						
1989				9						
1990	1	9	19	9	9		13			26
1991	14	3	18				96			
1992	6	3	2	11	7					
1993	12	3	16	3	11		52			399
1994	11		14	7	13		8	50		268
1995	10			3	6		91	62		304
1996		2	33	31	1		147	63		240
1997	95	33	30				137			258
1998	1	6		26	58			333		575
1999		11	34	185	72					362
2000	43		1	25	86		49			71
2001	14	2	4	18	116					237
2002	7		37	39	127	18				
TOTAL	260	419	409	659	678	18	907	511		2,791

LONGLINE gear

Figure 12 shows the size frequency distributions of red snapper (LL) gear by area (east and west GOM) and year. Due to small sample sizes (Table 5) it was difficult to identify any consistent patterns of size differences between catches from the east and west GOM. Higher sample sizes were available from 1998 and later. In 1999-2002, the size classes with the highest proportions in the west GOM shifted from TL 22-24 inch in 1998 to TL 26-28.

CONCLUSIONS

- Landings in the Florida west coast (cell 1-7) consistently had a higher proportion of larger animals than landings in the Florida panhandle (cells 8-10).
- Landings tend to have a higher proportion of larger animals on the western side than on the eastern side of the region comprised by cells 8-11.
- The size differences observed between the Florida west coast and the panhandle can not be explained by the permit types.
- Red snapper landed in the Florida west coast with electric HL were larger than fish landed with manual HL only from 1984 to 1988.
- No consistent pattern of size differences were observed between Texas (cells 18-21) and the northern GOM (cell 13-17).
- This data suggests that in calculating the commercial catch-at-size, the following stratification scheme might be considered:

For HL gear:

- (1) statistical areas 1-7.
- (2) statistical areas 8-10 (or 8-11).
- (3) statistical areas 11-21 (or 12-21).

For LL gear:

- (1) East GOM: statistical areas 1-10.
- (2) West GOM: statistical areas 11-21.

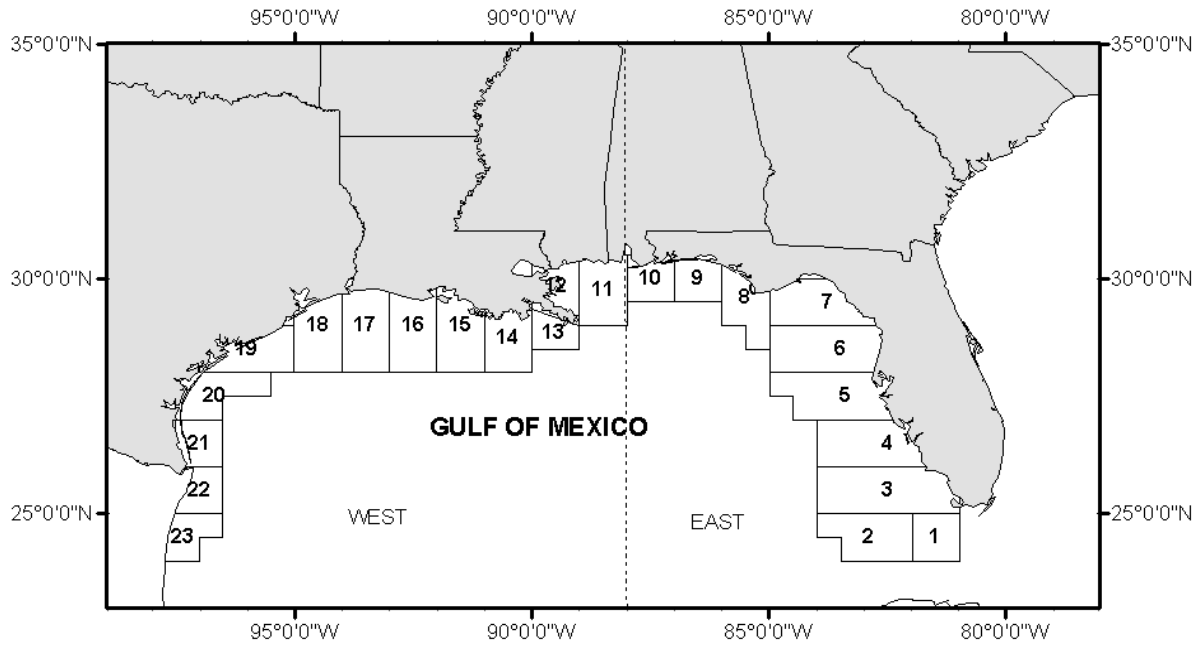


Figure 1: Map of the Gulf of Mexico (GOM) showing the statistical grids and the 88° W meridian dividing the east and west GOM.

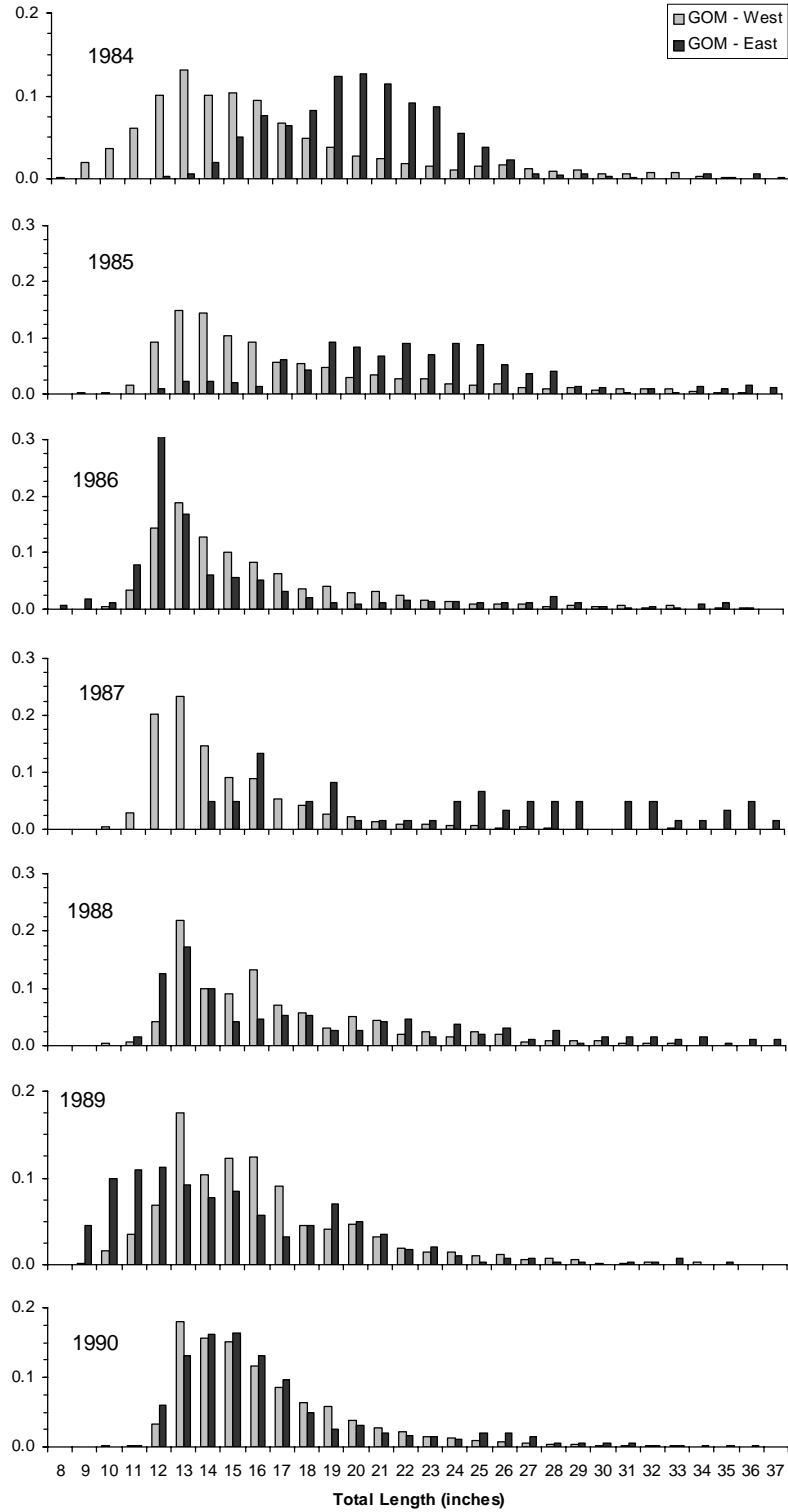


Figure 2: Size frequency distribution of red snapper caught by handline gear (HL) and sampled by TIP from 1984 to 2003

Figure 2 (continued)

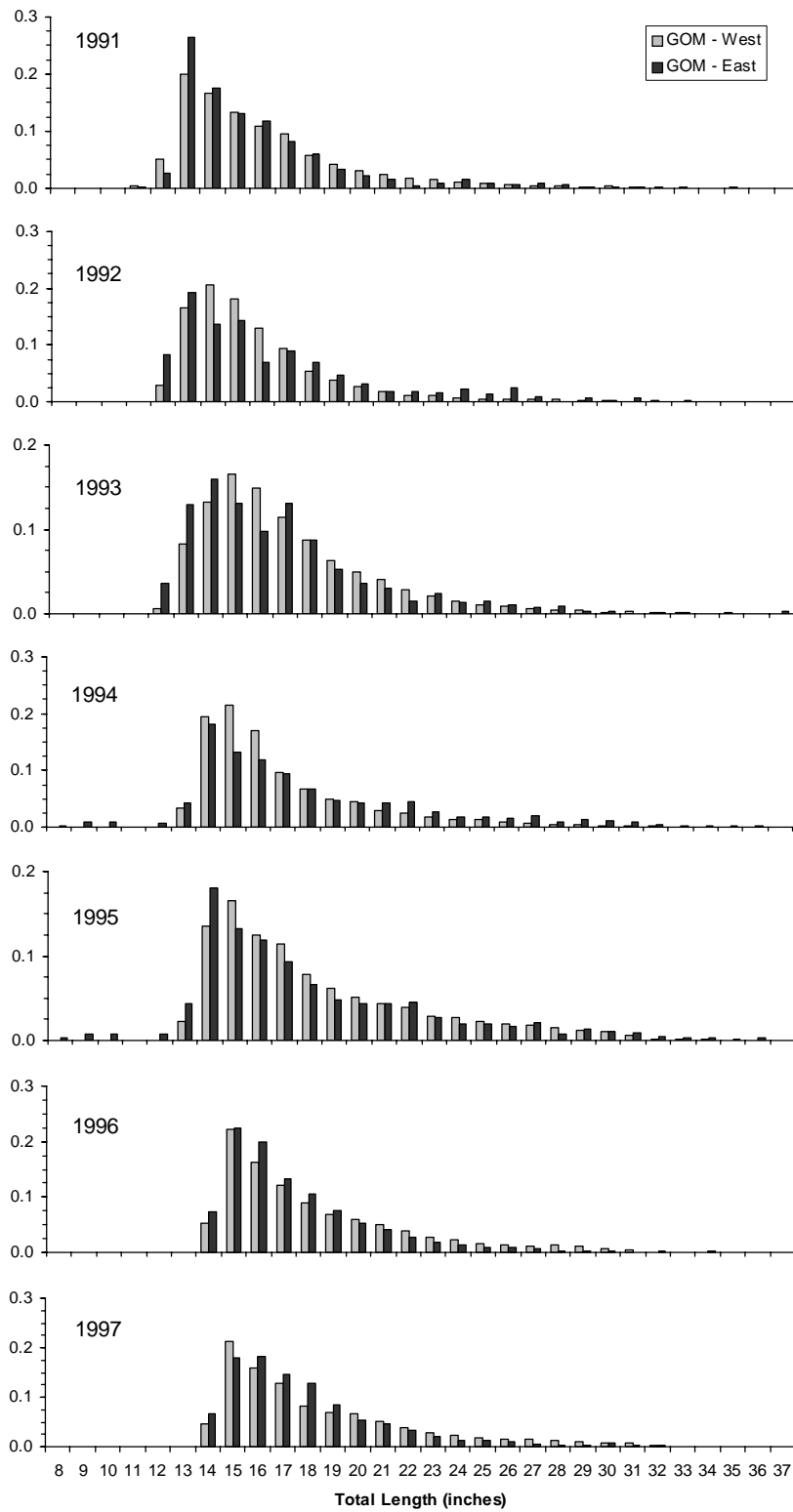
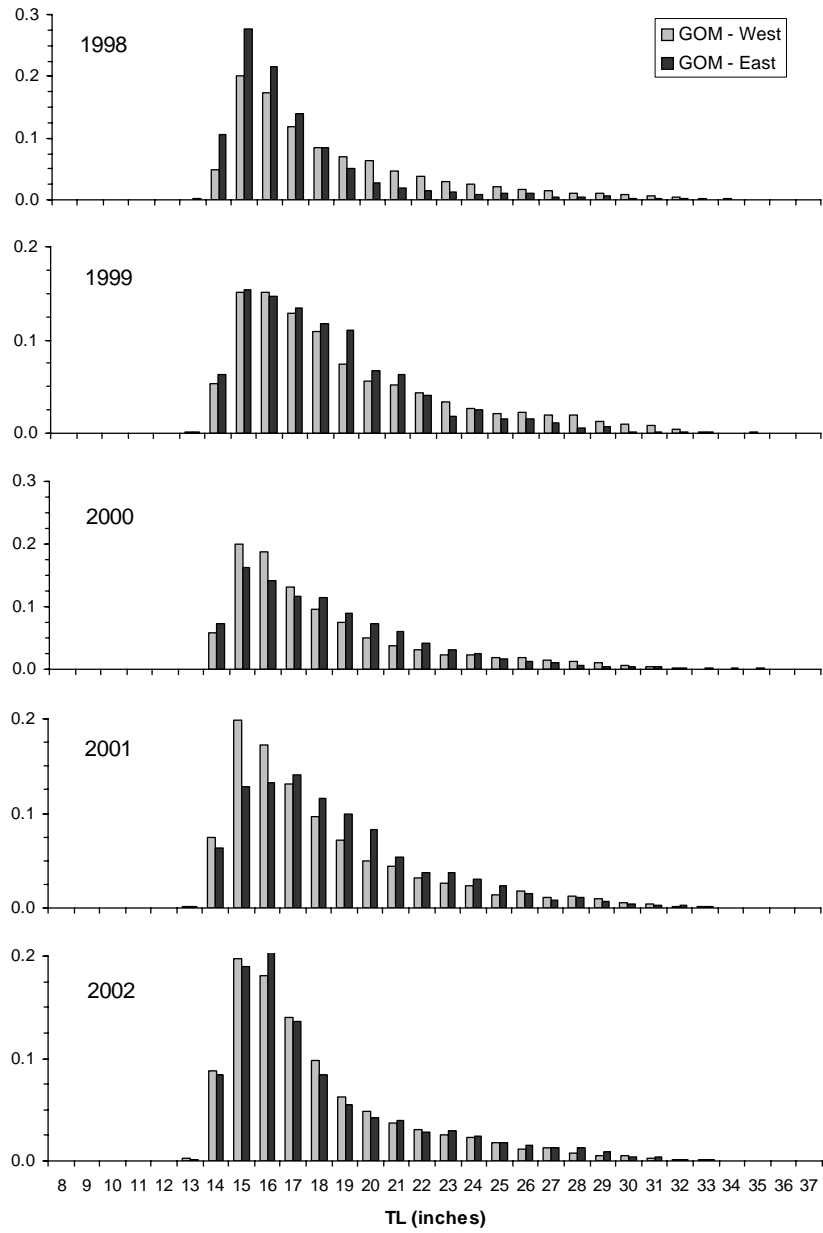


Figure 2 (continued)



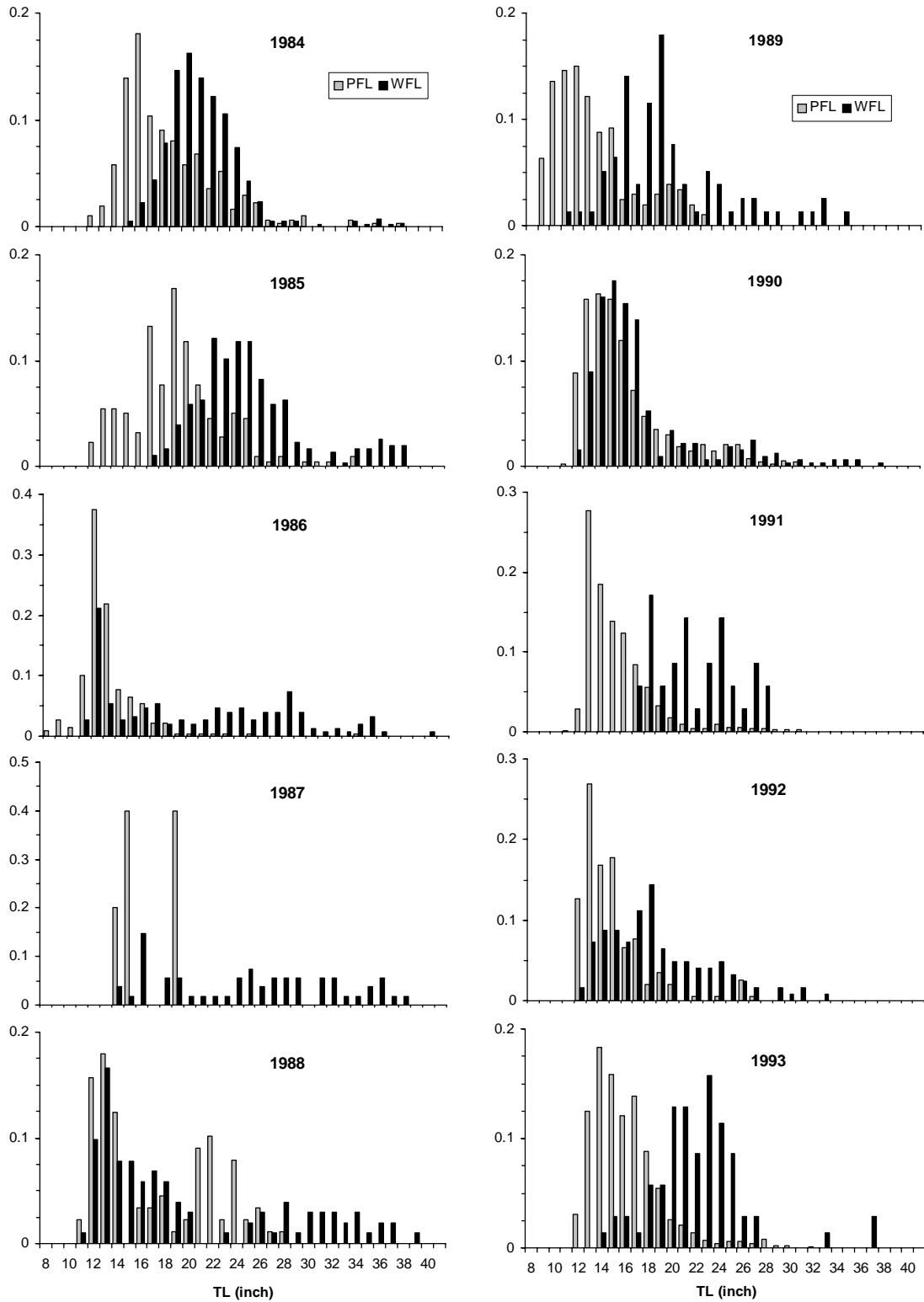
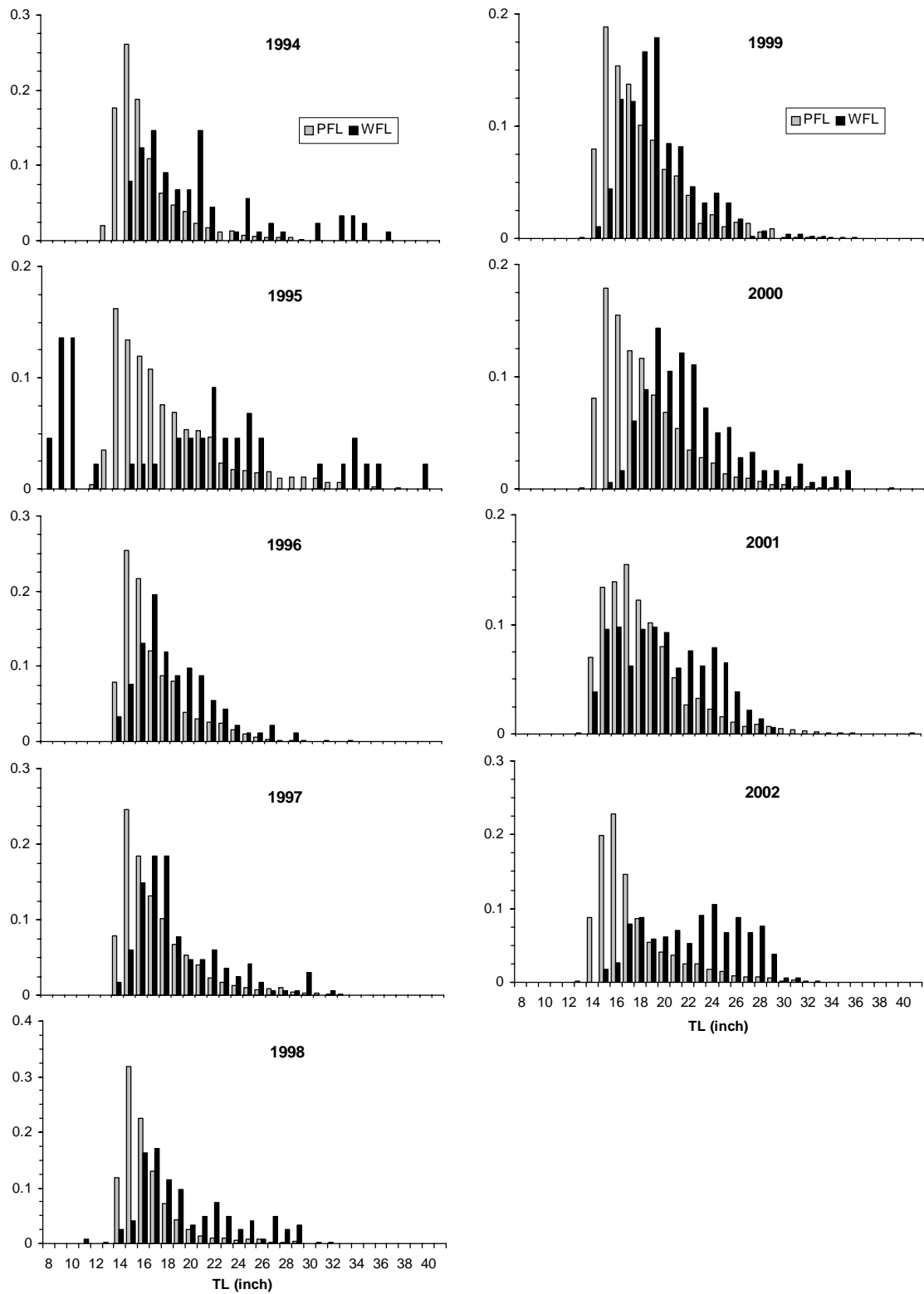


Figure 3: Size frequency distribution of red snappers landed and sampled by TIP in the Florida west coast (WFL, cells 1-7) and the Florida panhandle (PFL, cells 8-10).

Figure 3 (continued)



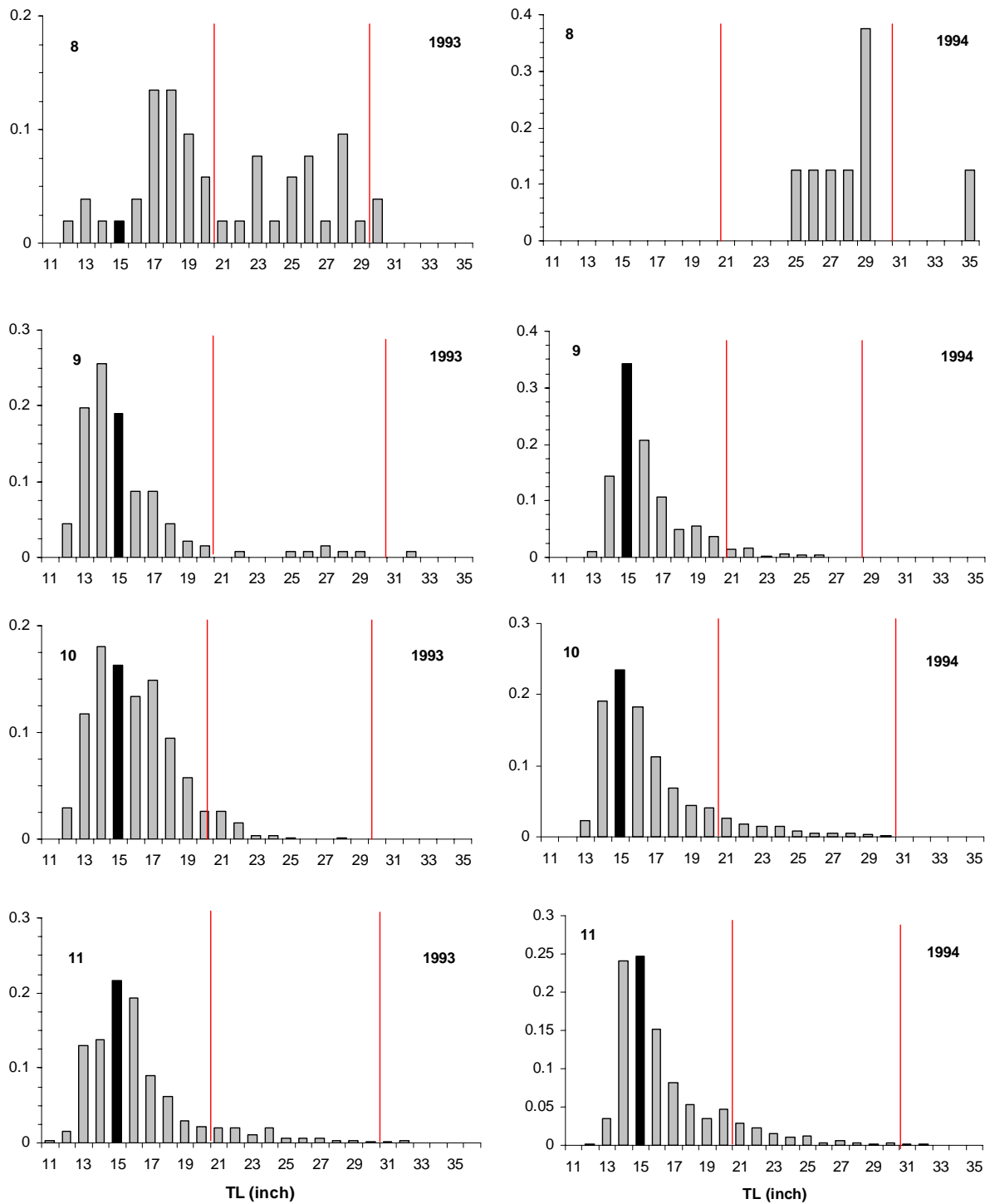


Figure4: Relative size frequency distribution of res snapper landings sampled by TIP in grid cells 8-11 from 1993 to 2002. Dark bar indicates legal minimum size (15 inch).

Figure 4 (continued)

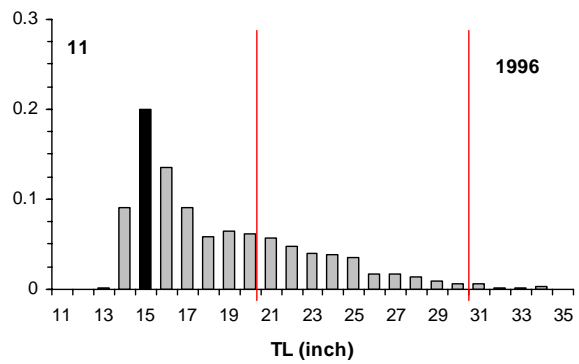
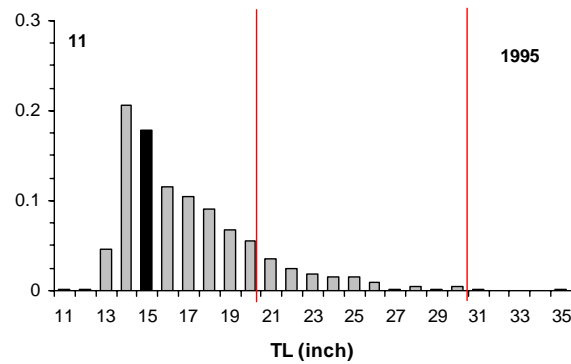
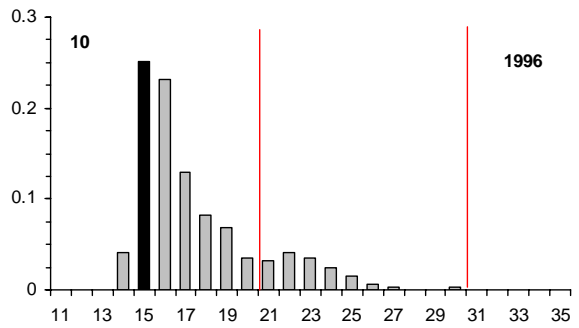
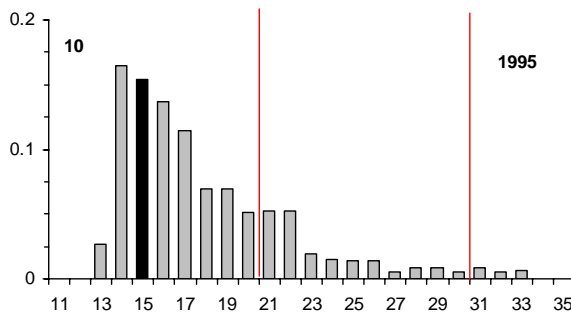
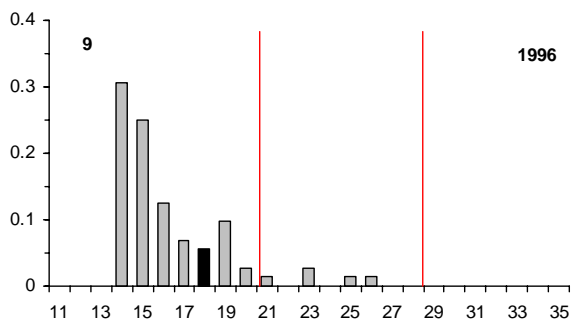
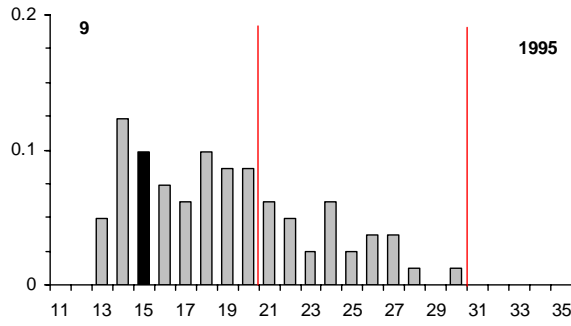
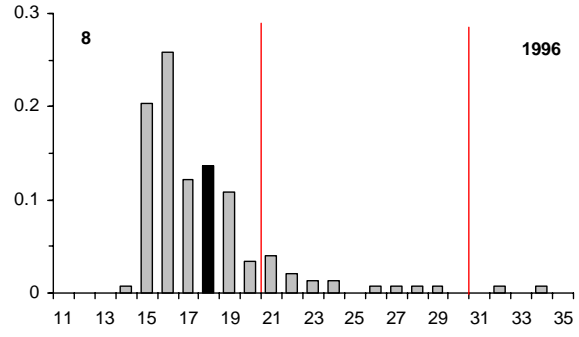
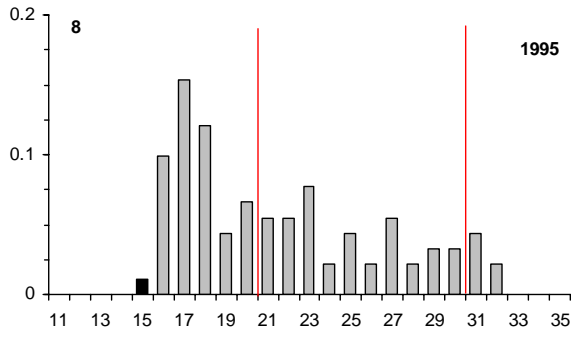
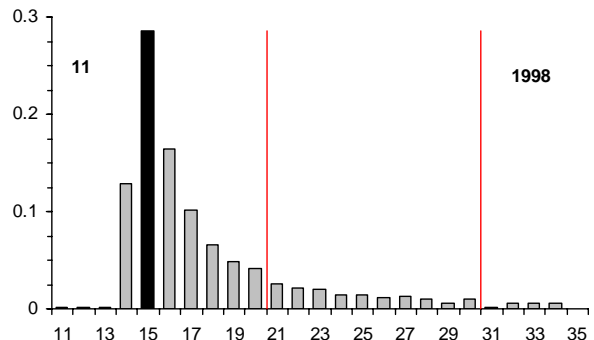
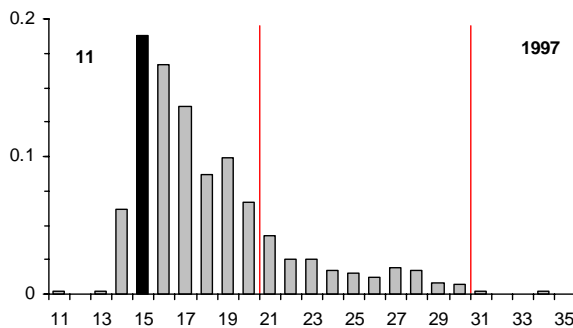
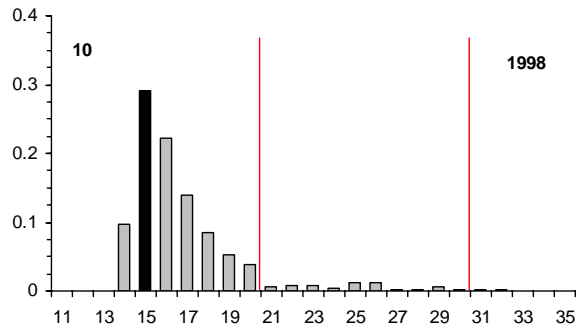
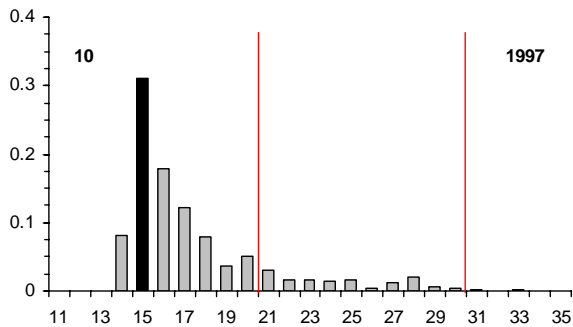
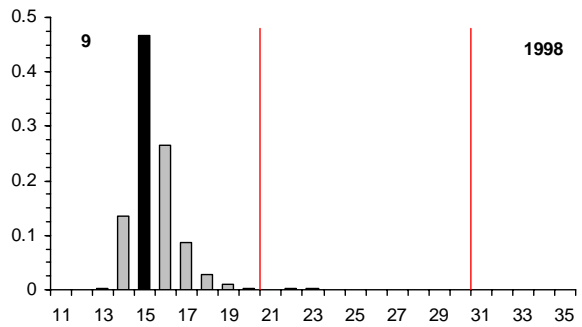
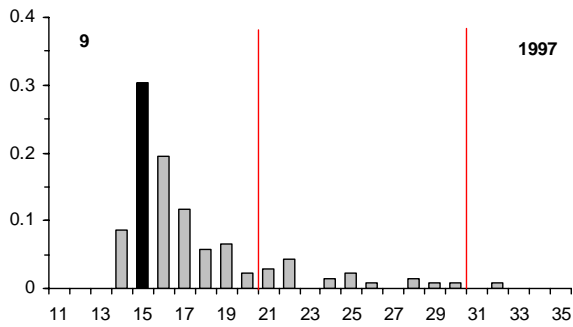
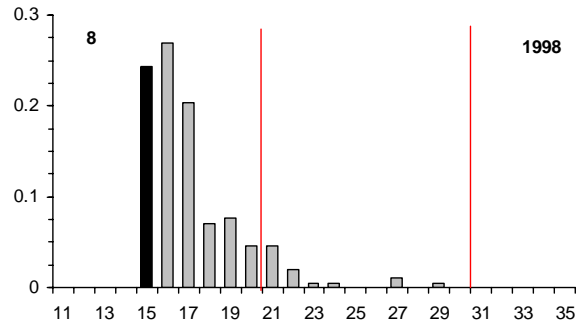
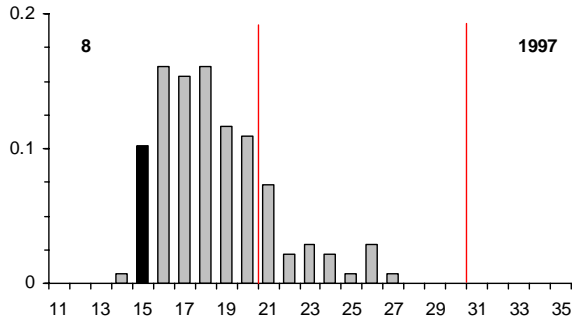


Figure 4 (continued)



TL (inch)

TL (inch)

Figure 4 (continued)

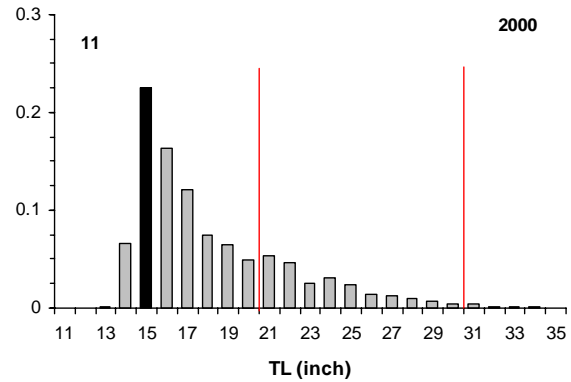
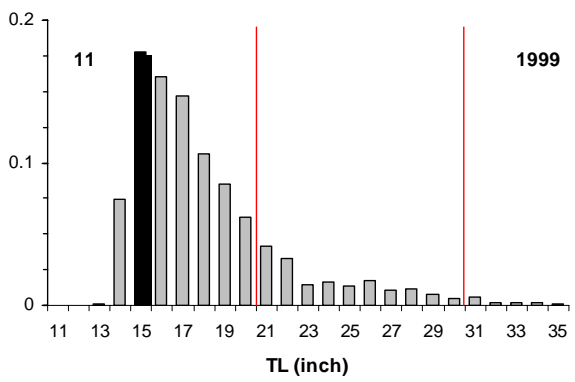
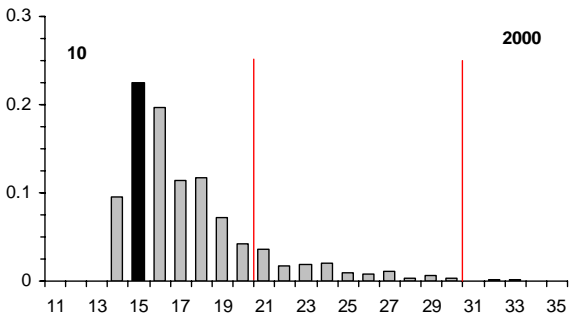
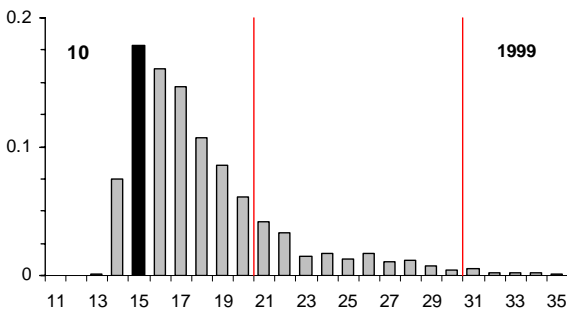
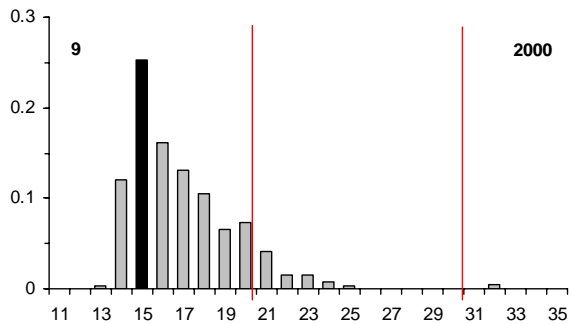
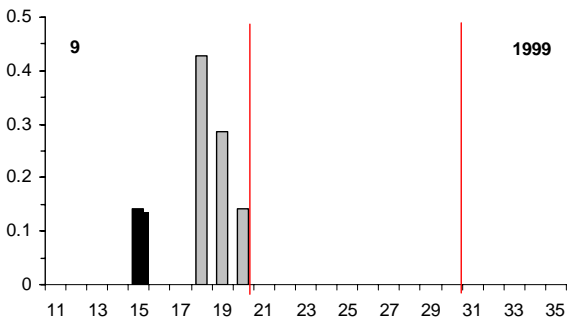
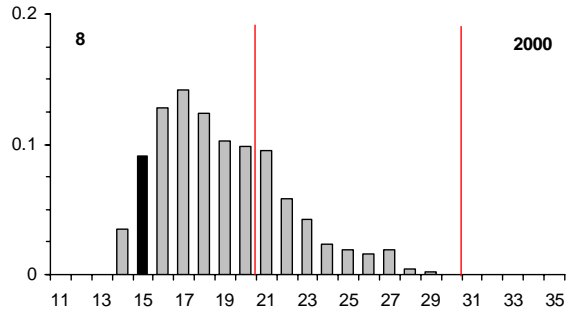
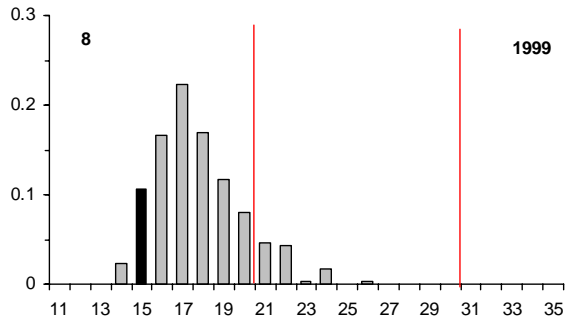
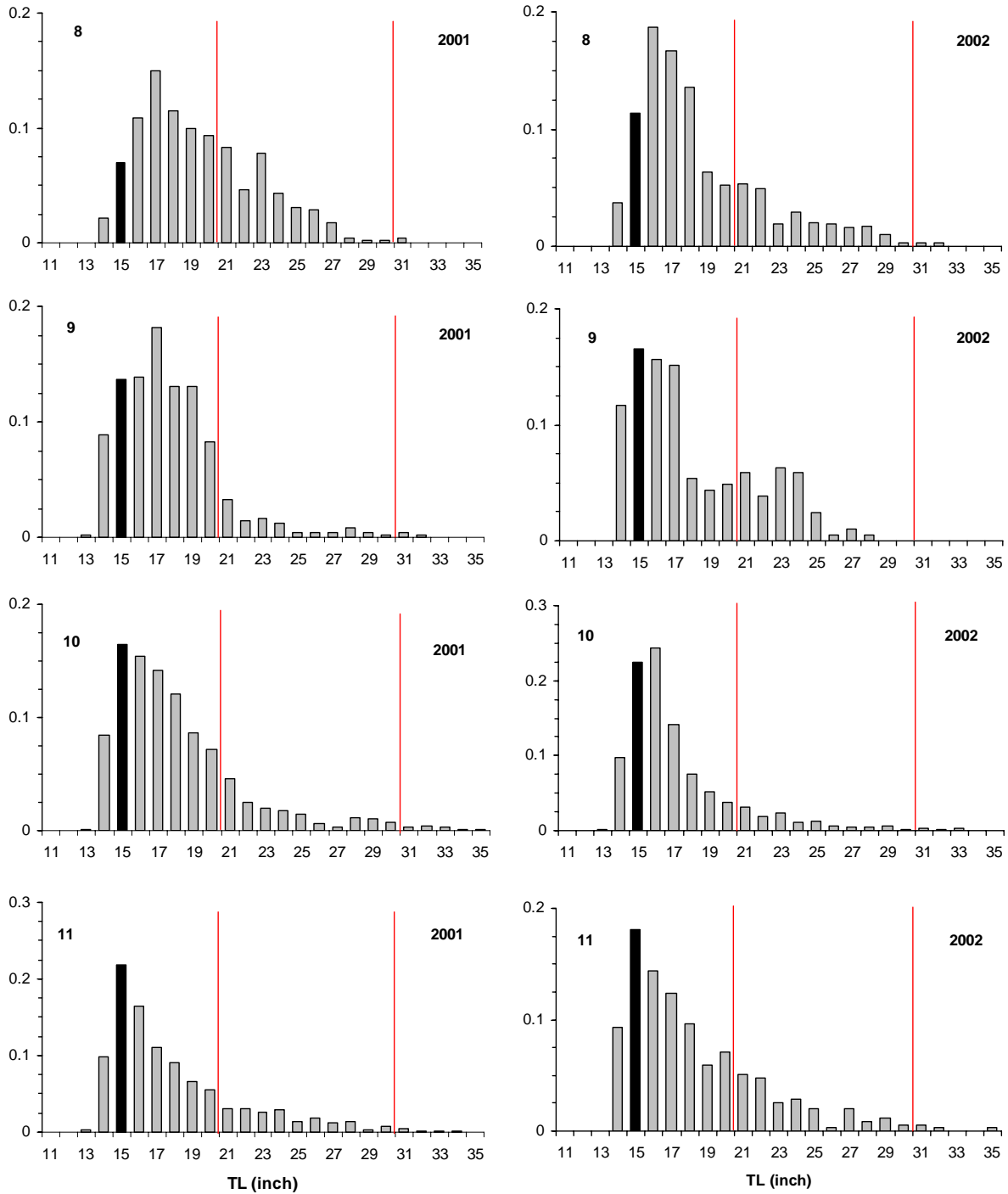


Figure 4 (continued)



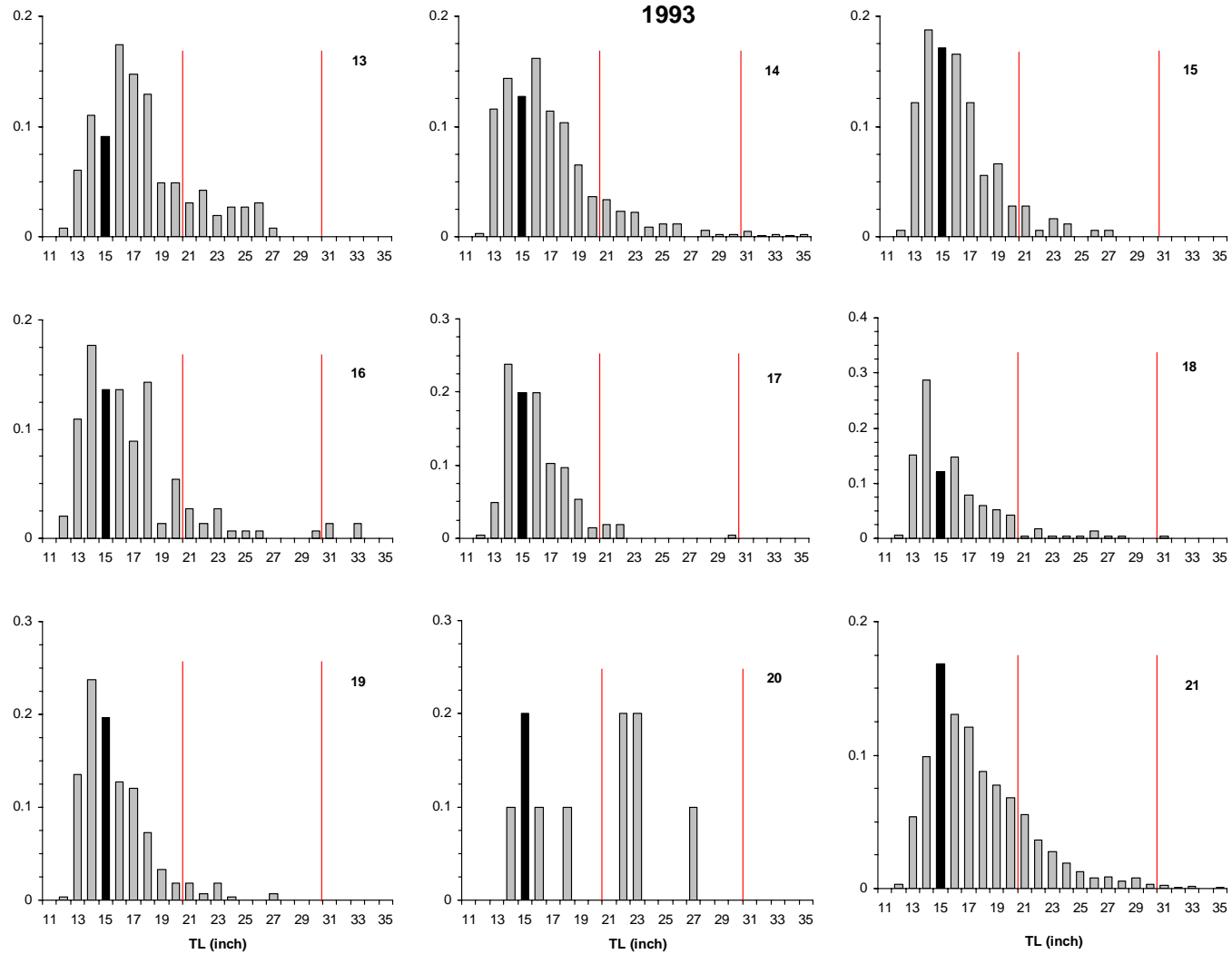


Figure 5: Relative size frequency distribution of res snapper landings sampled by TIP in grid cells 13-21 from 1993 to 2002. Dark bar indicates legal minimum size (15 inch).

Figure 5 (continued)

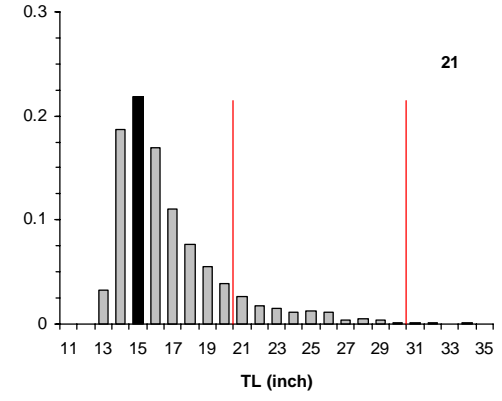
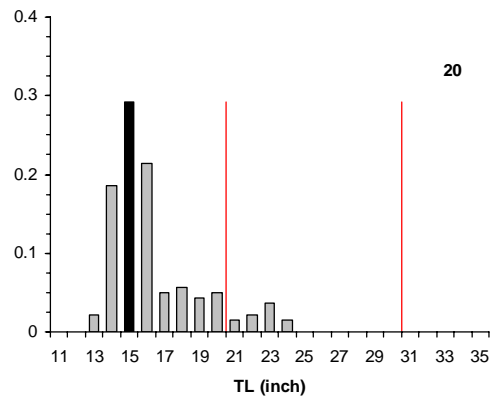
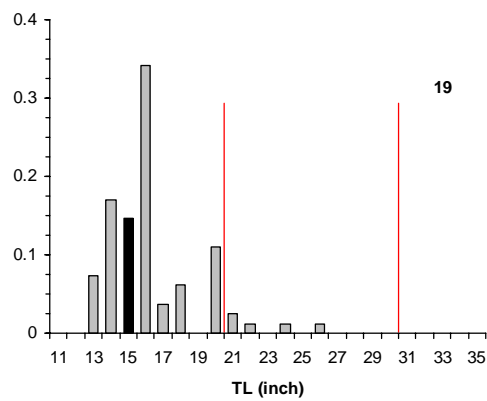
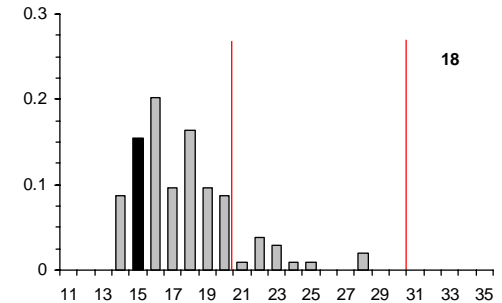
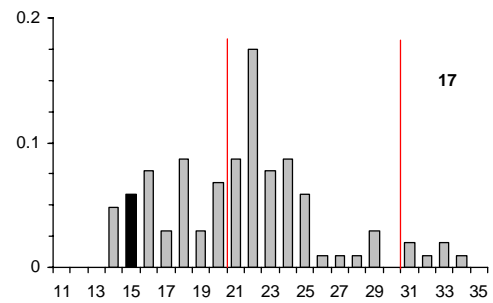
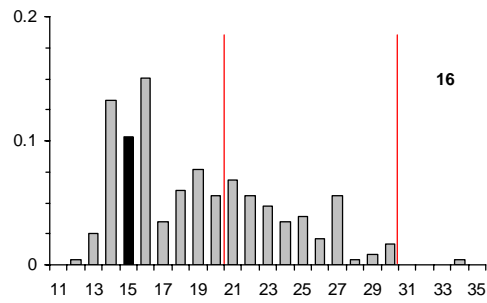
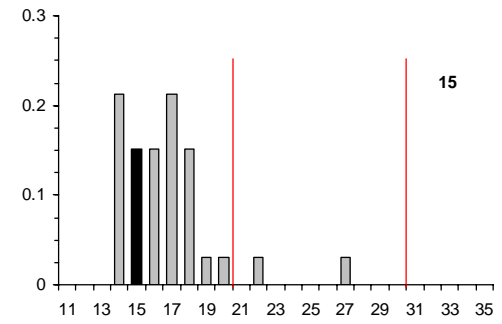
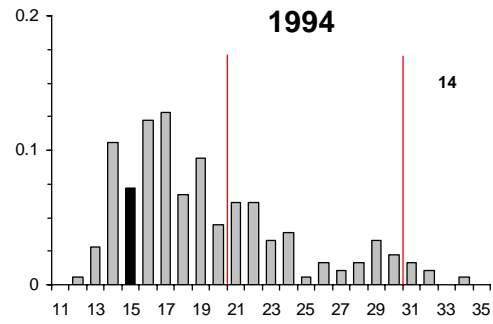
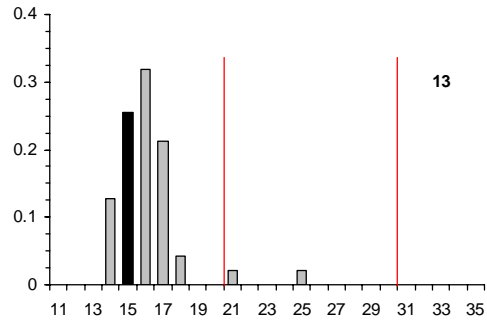


Figure 5 (continued)

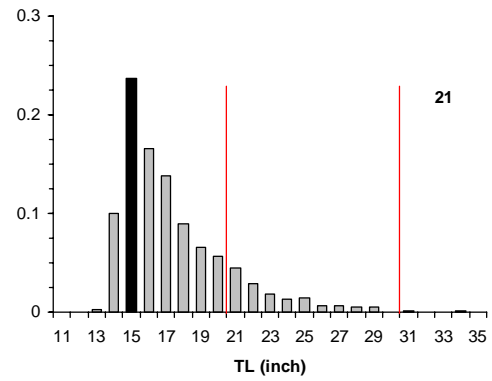
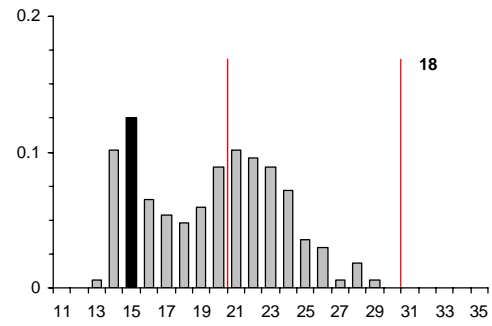
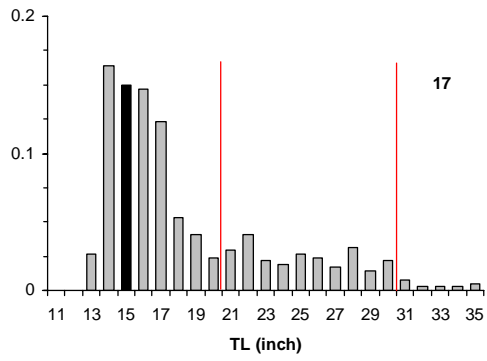
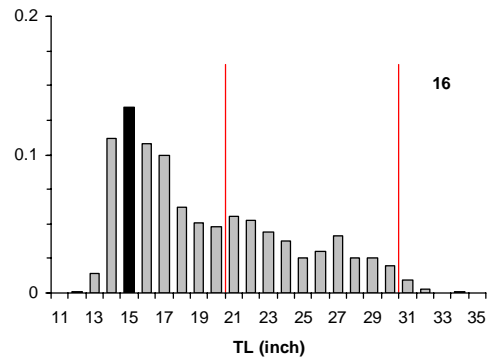
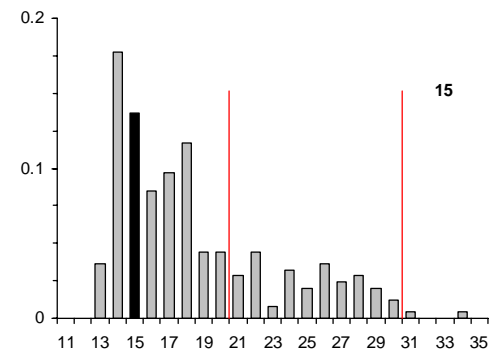
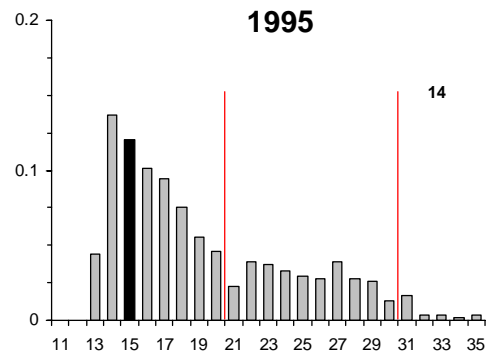
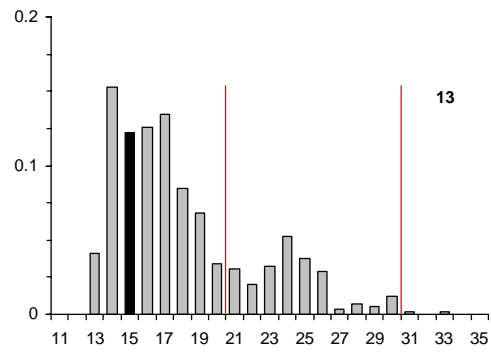


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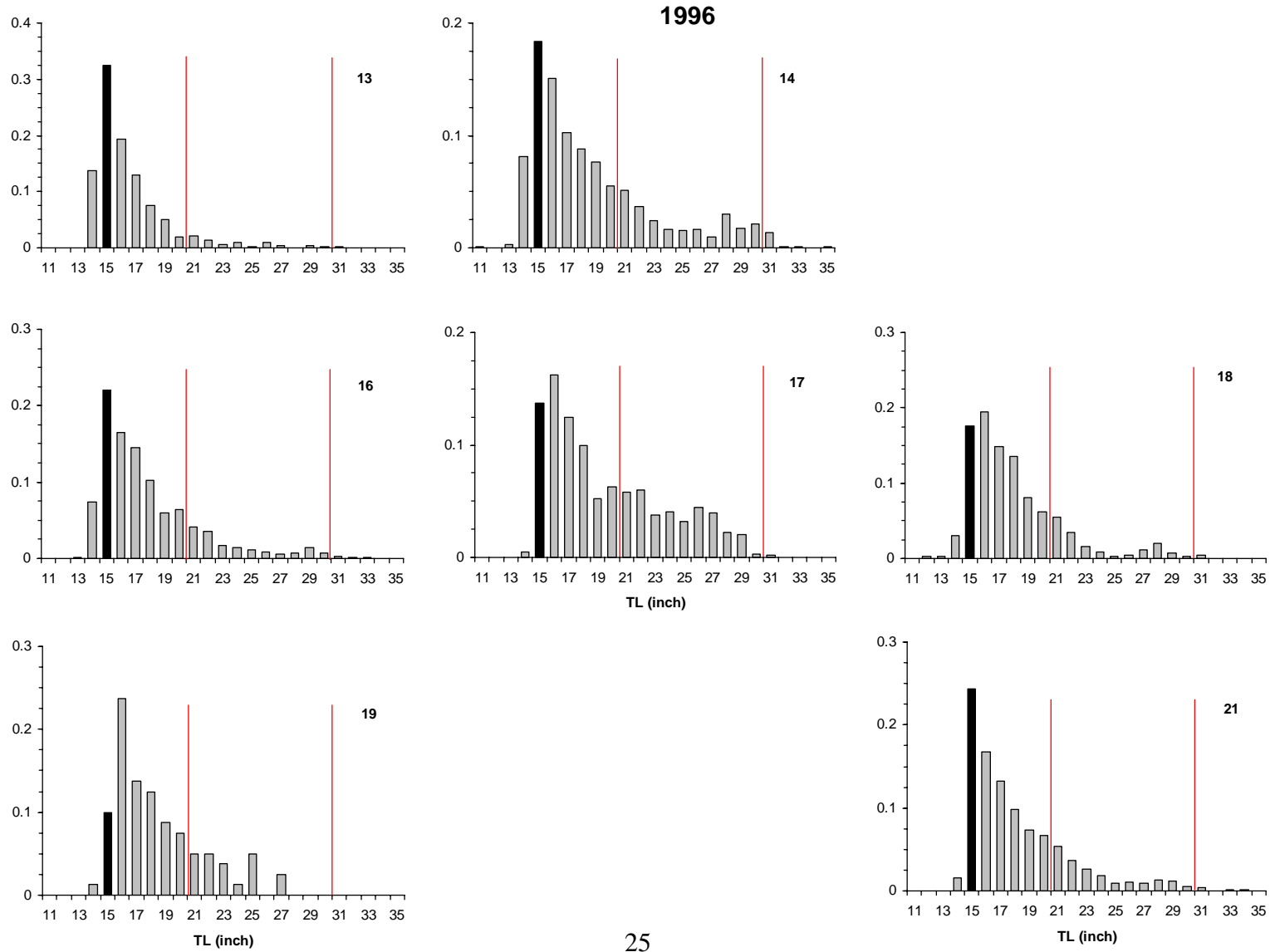


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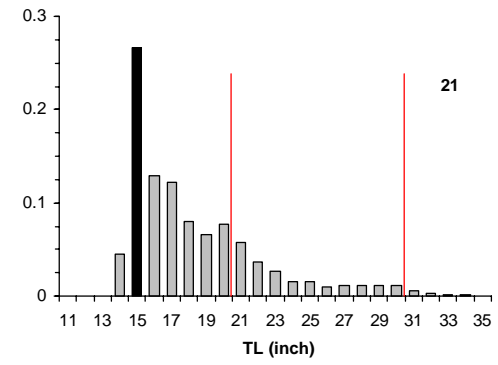
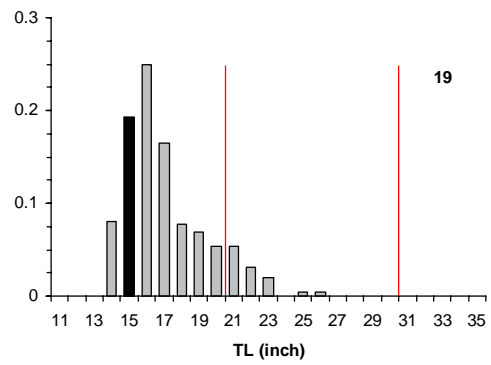
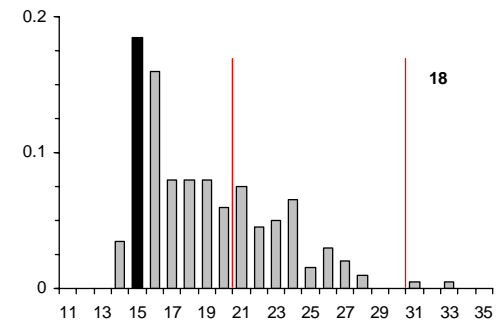
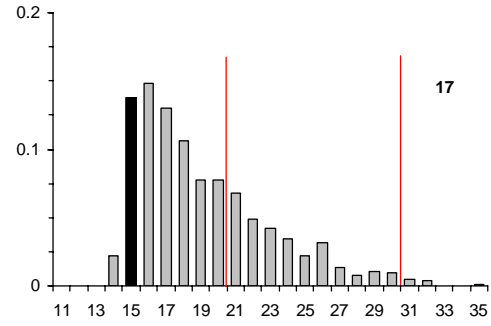
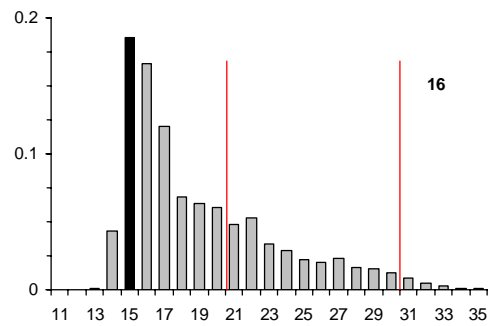
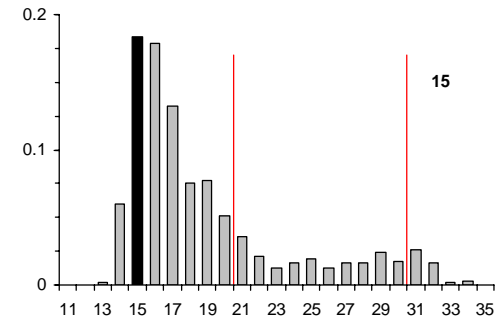
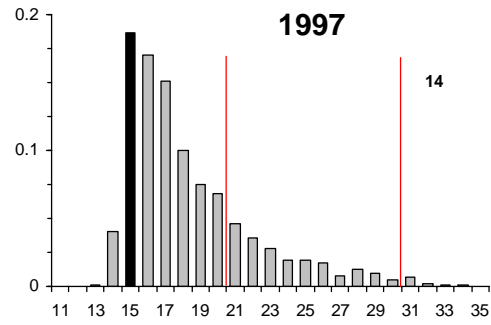
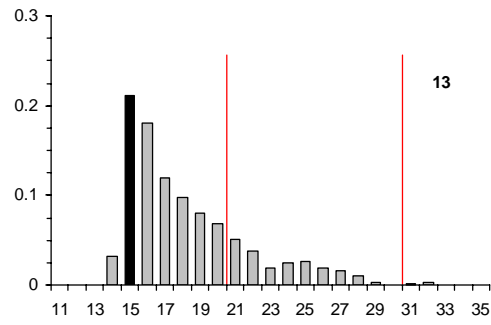


Figure 5 (continued)

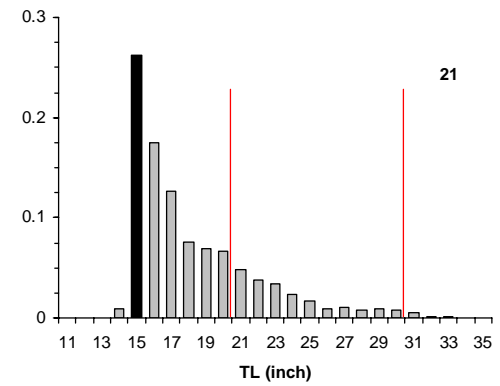
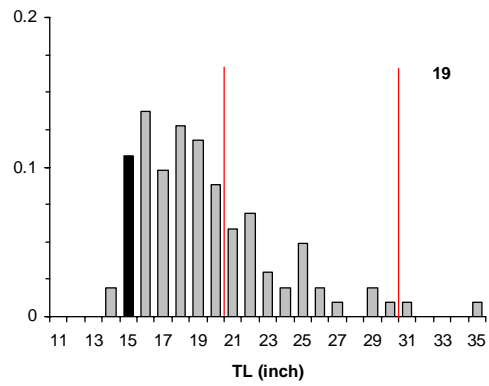
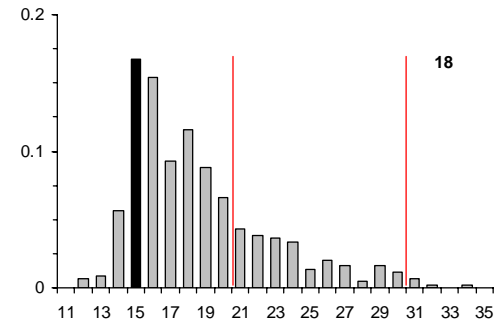
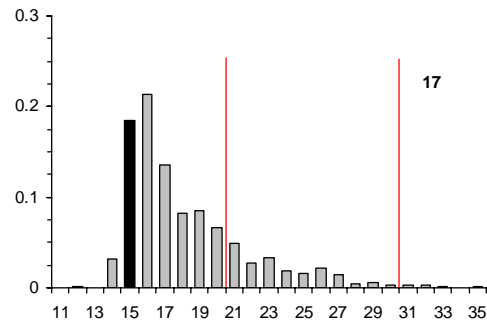
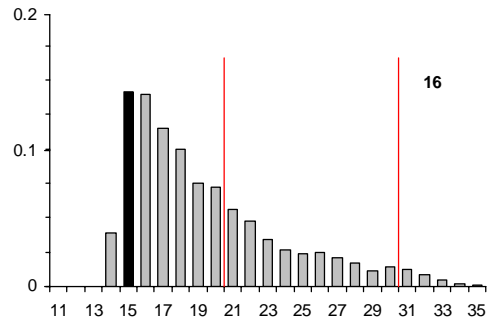
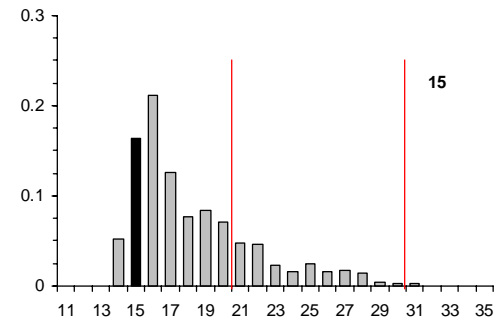
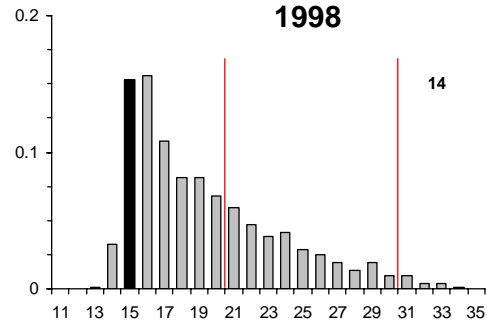
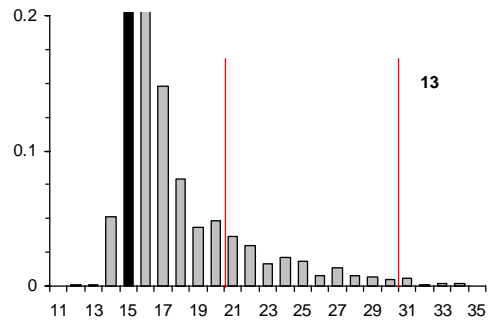


Figure 5 (continued)

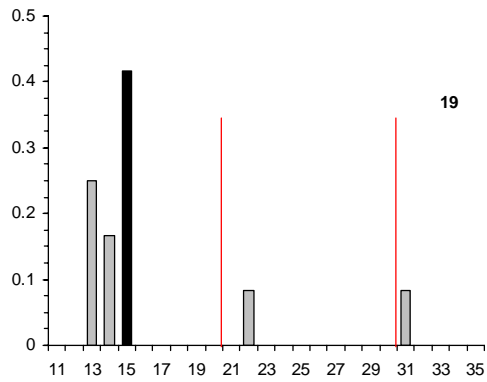
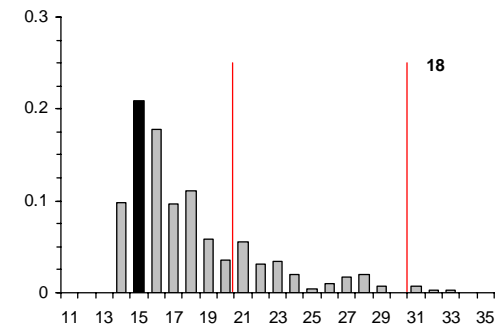
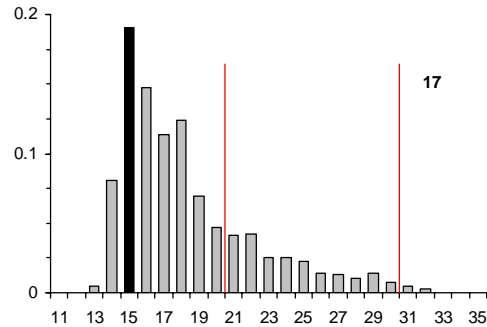
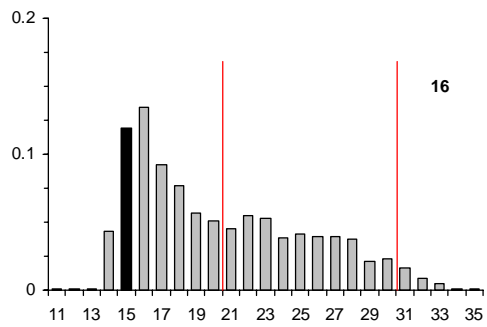
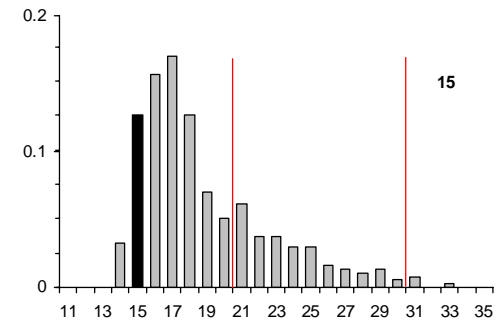
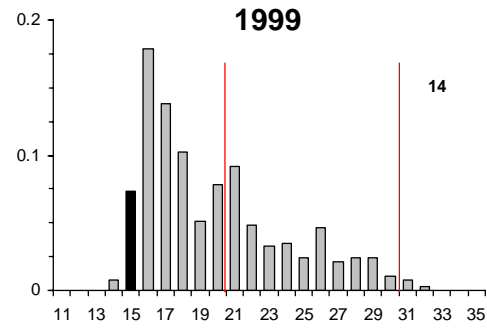
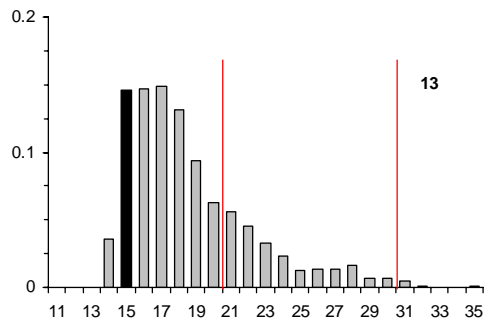


Figure 5 (continued)

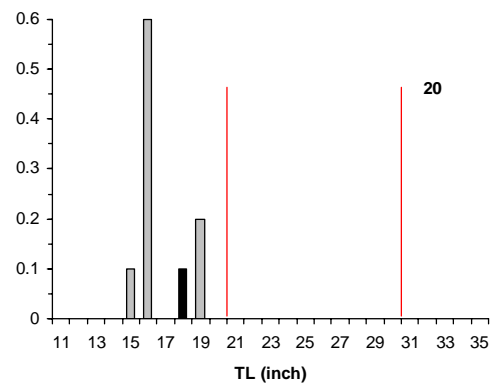
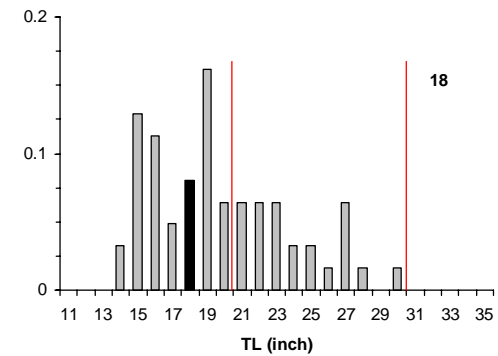
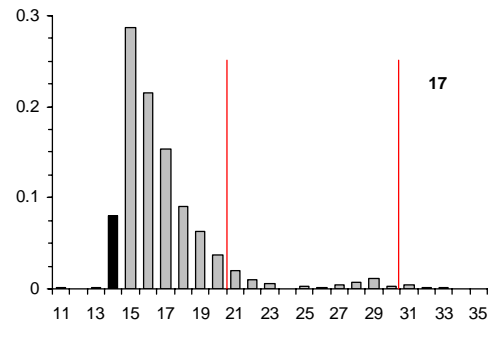
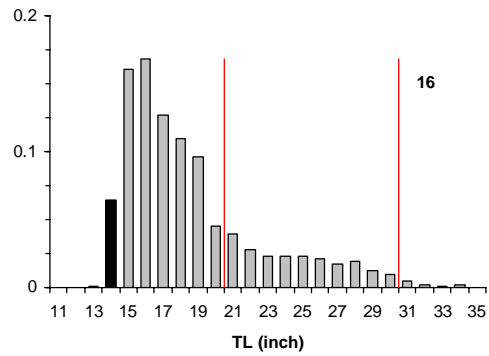
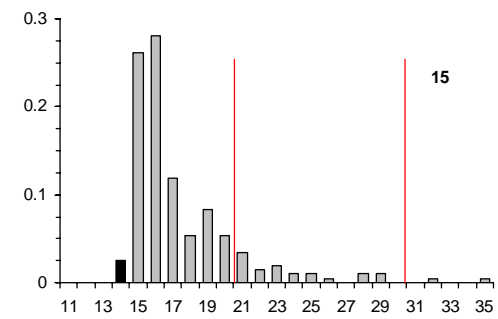
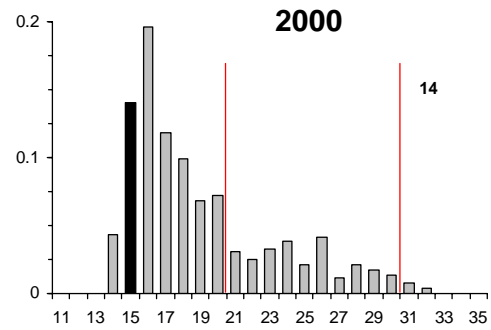
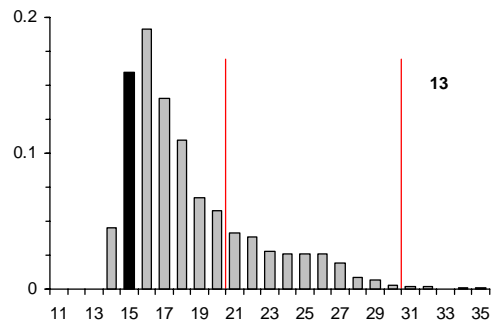


Figure 5 (continued)

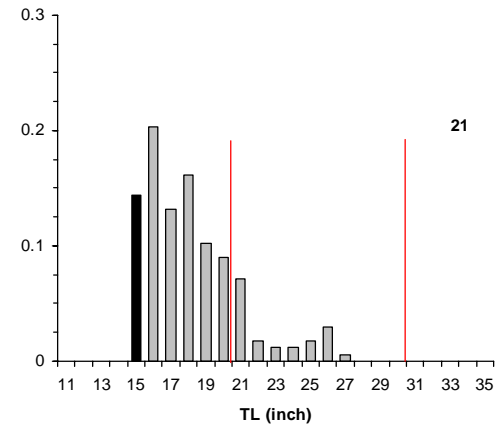
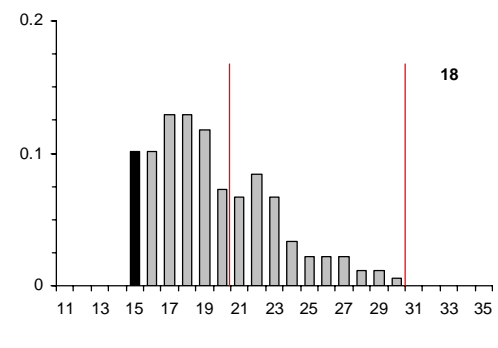
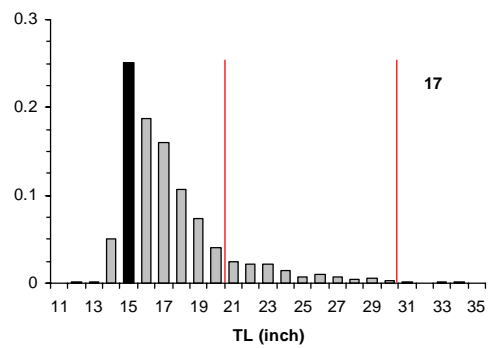
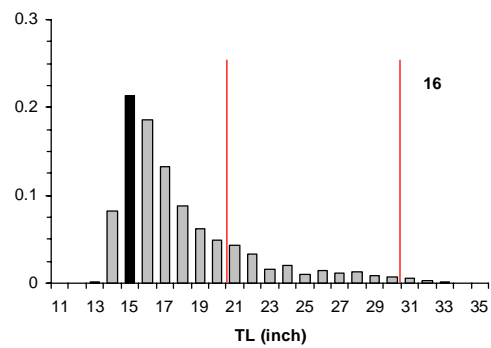
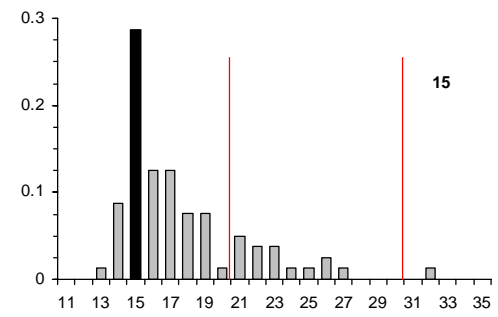
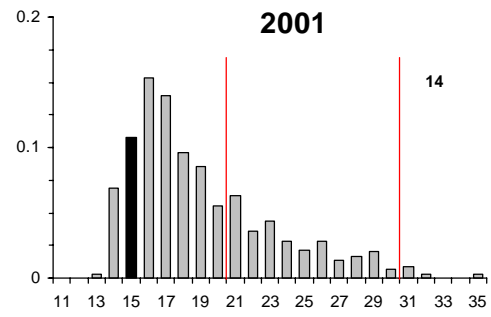
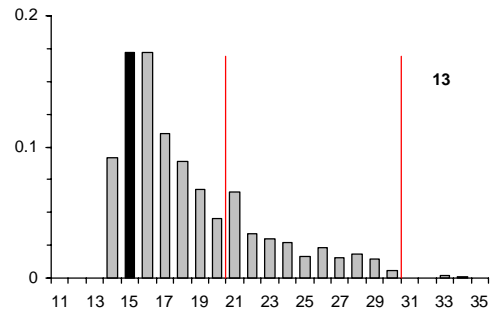
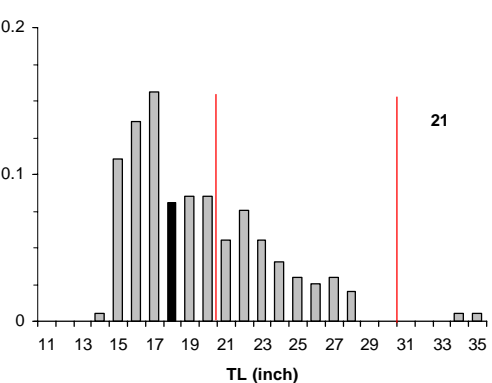
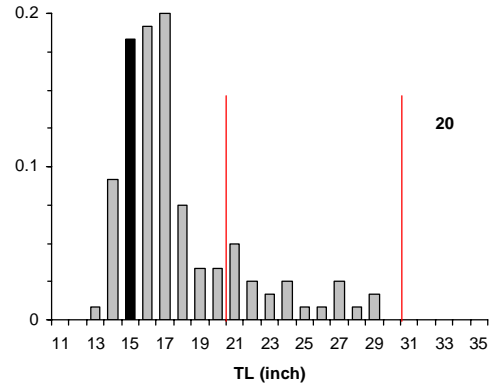
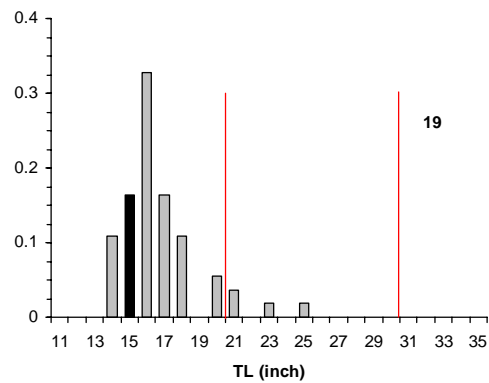
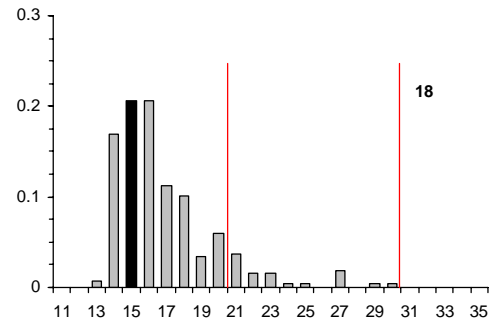
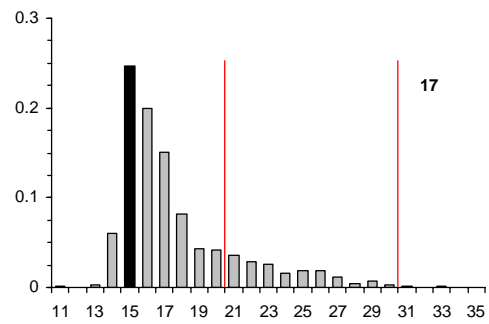
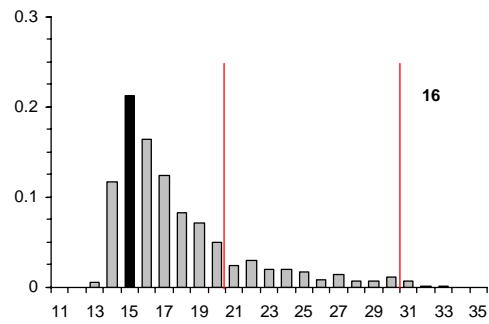
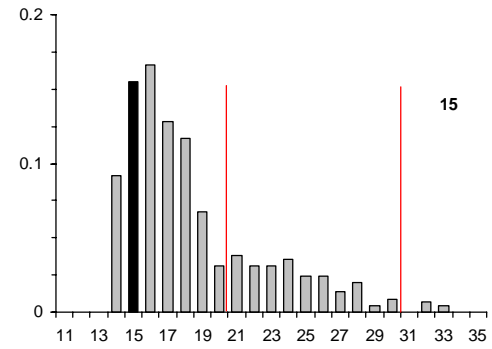
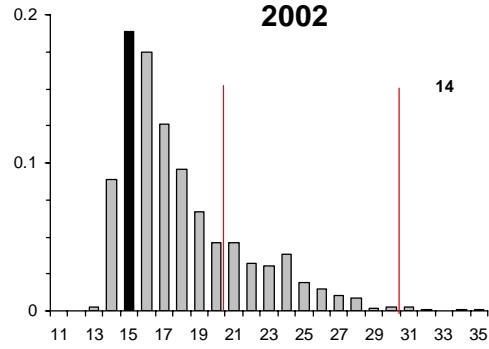
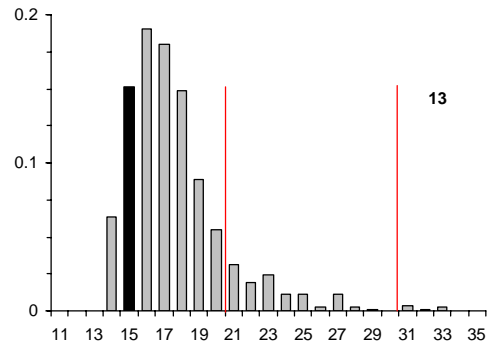


Figure 5 (continued)



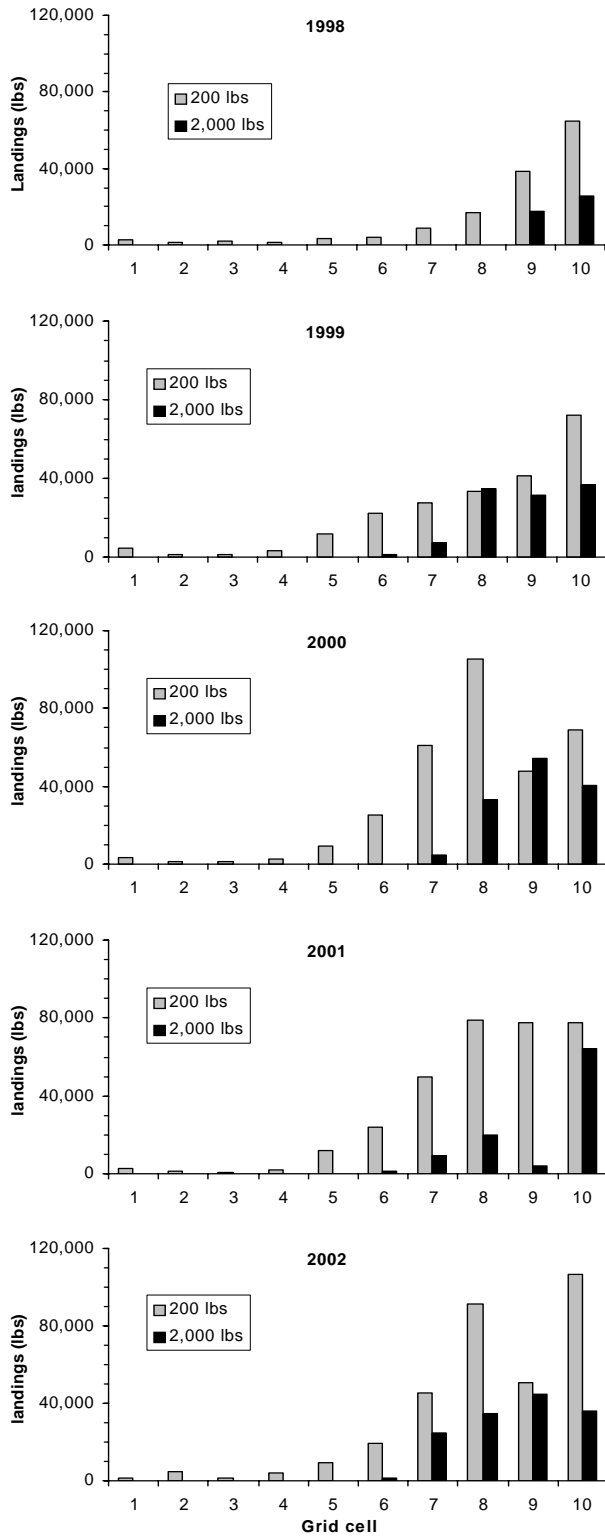


Figure 6: catches (lbs) harvested under the 200 (grey bars) and 2,000 lbs (black bars) permit types by fishing location (grid cells) (Florida Trip Ticket data).

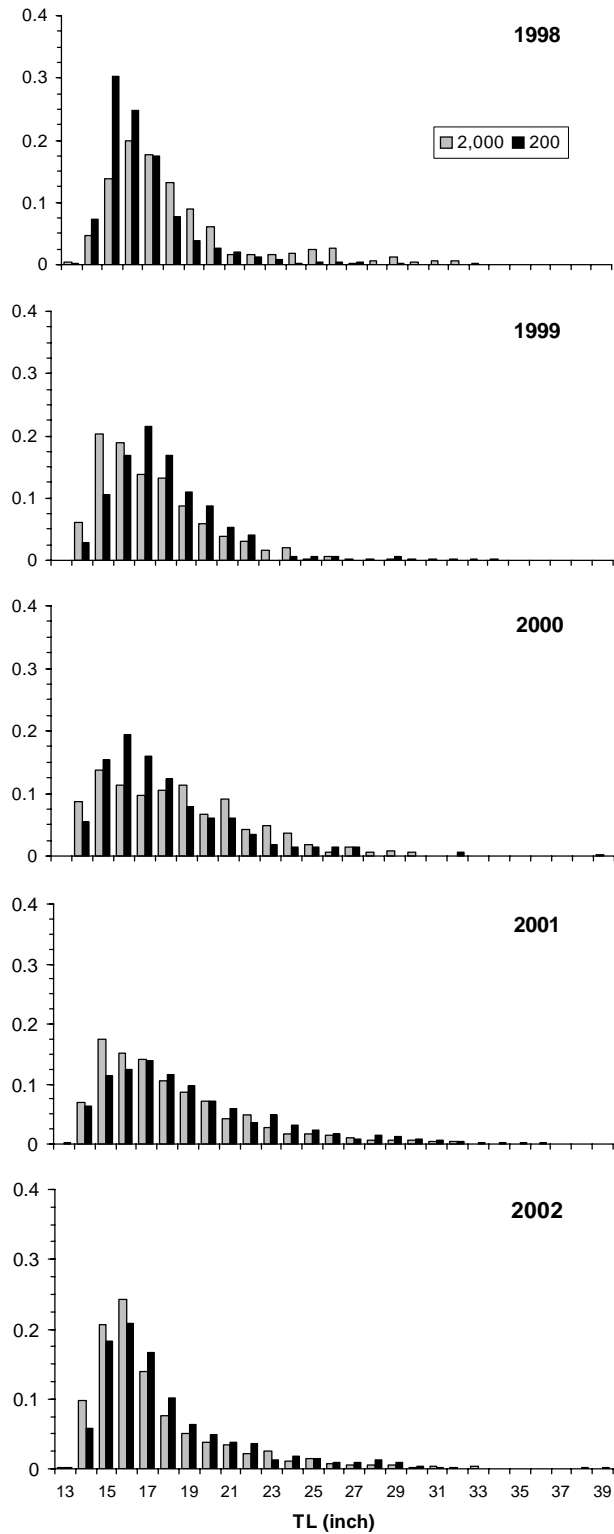


Figure 7: Relative size frequency distributions of red snapper sampled by TIP harvested in cells 8-10 (combined) under permit types 200 (black bars) and 2,000 lbs (grey bars) from 1998 to 2002.

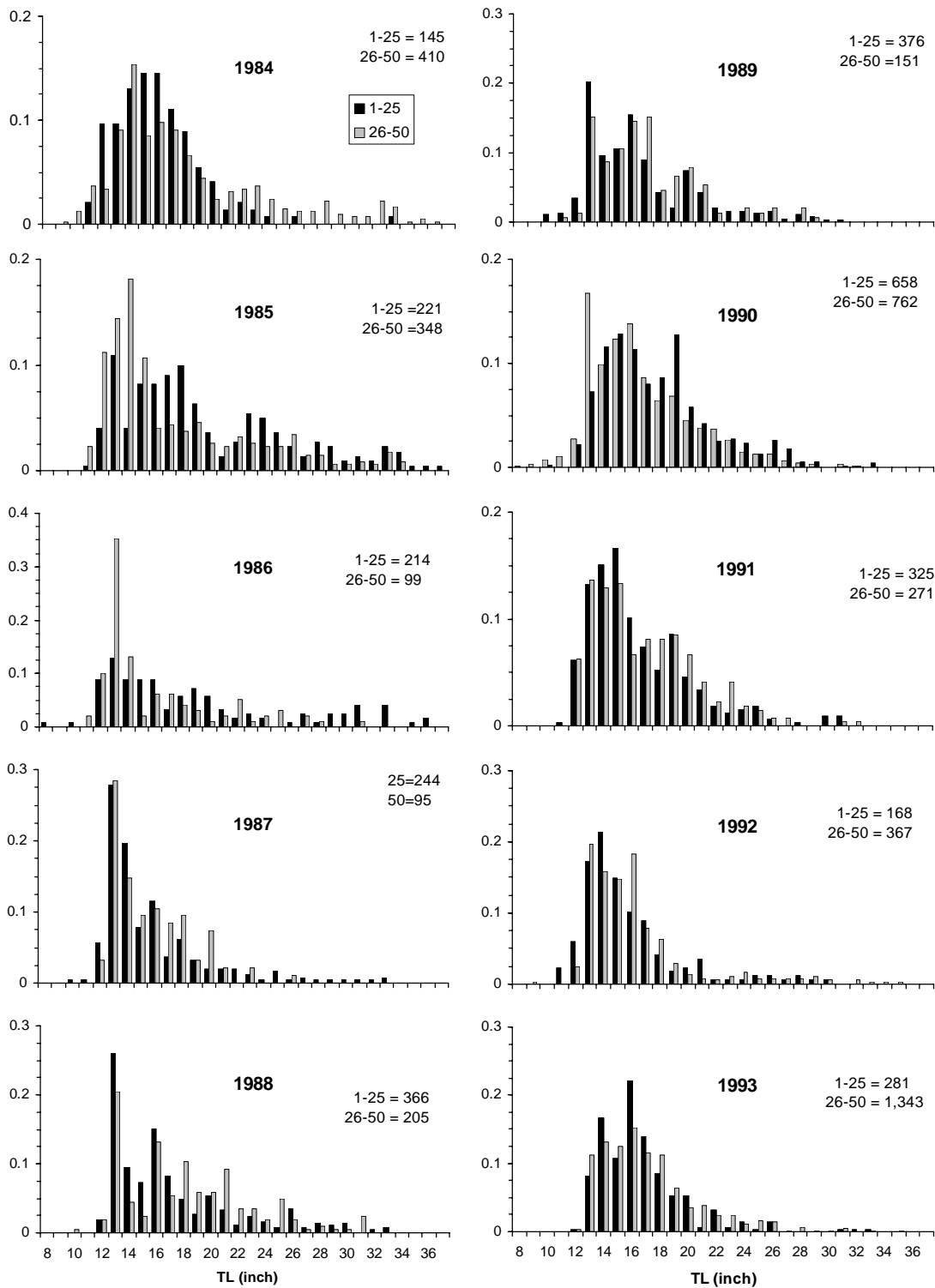
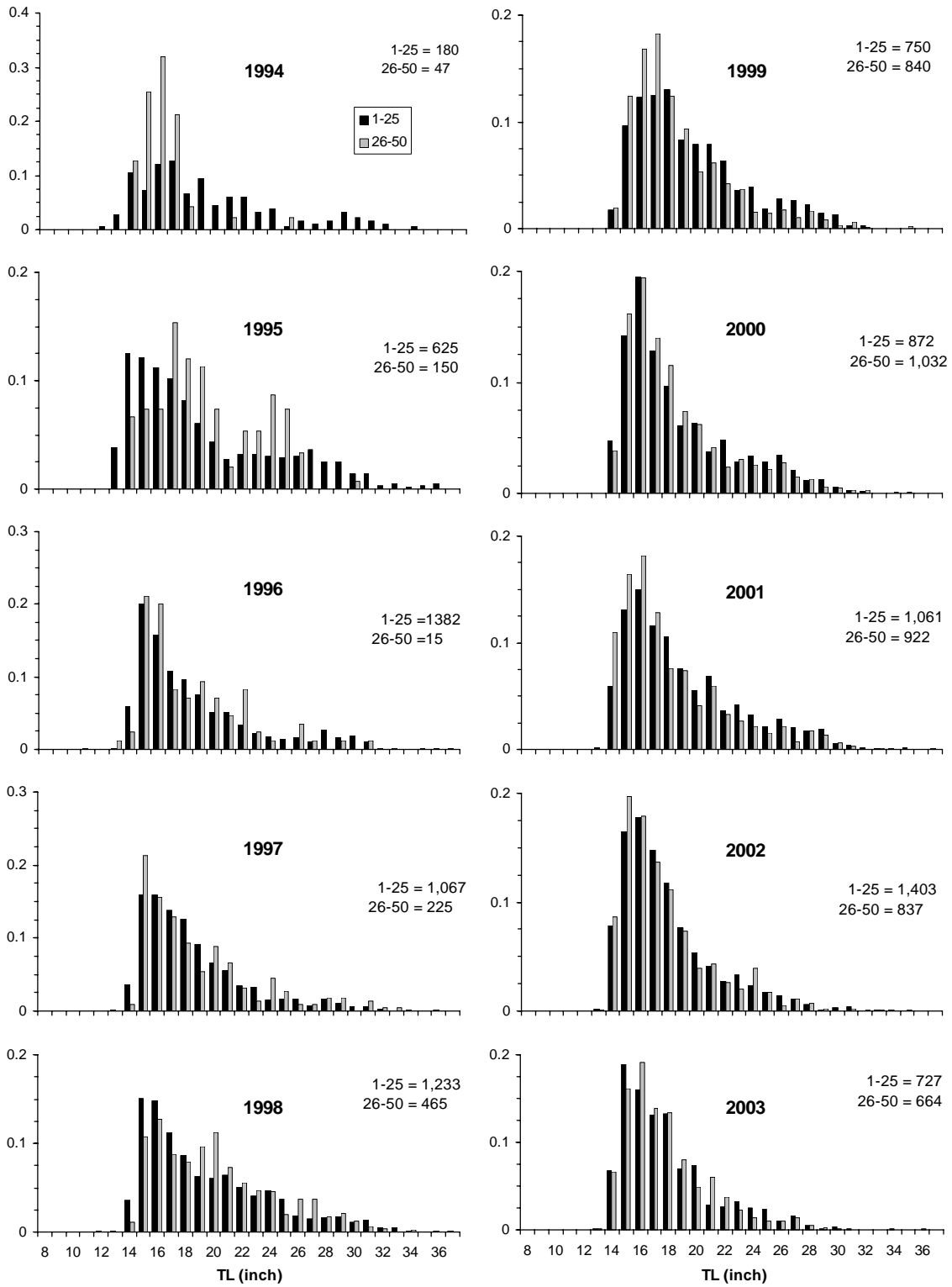


Figure 8: Relative size frequency distribution of red snapper from samples with less than 25 animals (black bars) and 26-50 animals (grey bars) for all grid cells combined from 1984 to 2002. Sample sizes are provided in each graph.

Figure 8 (continued)



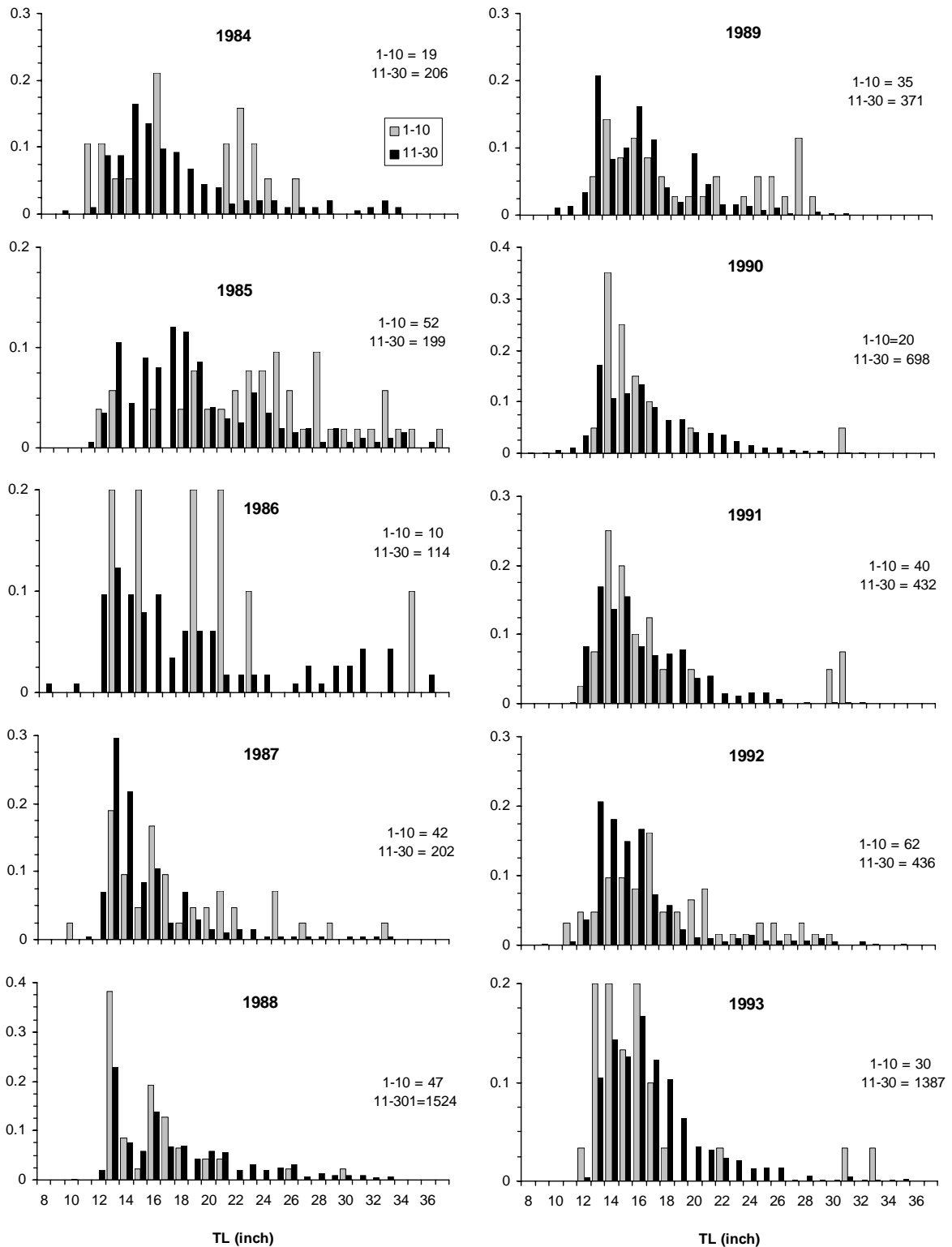
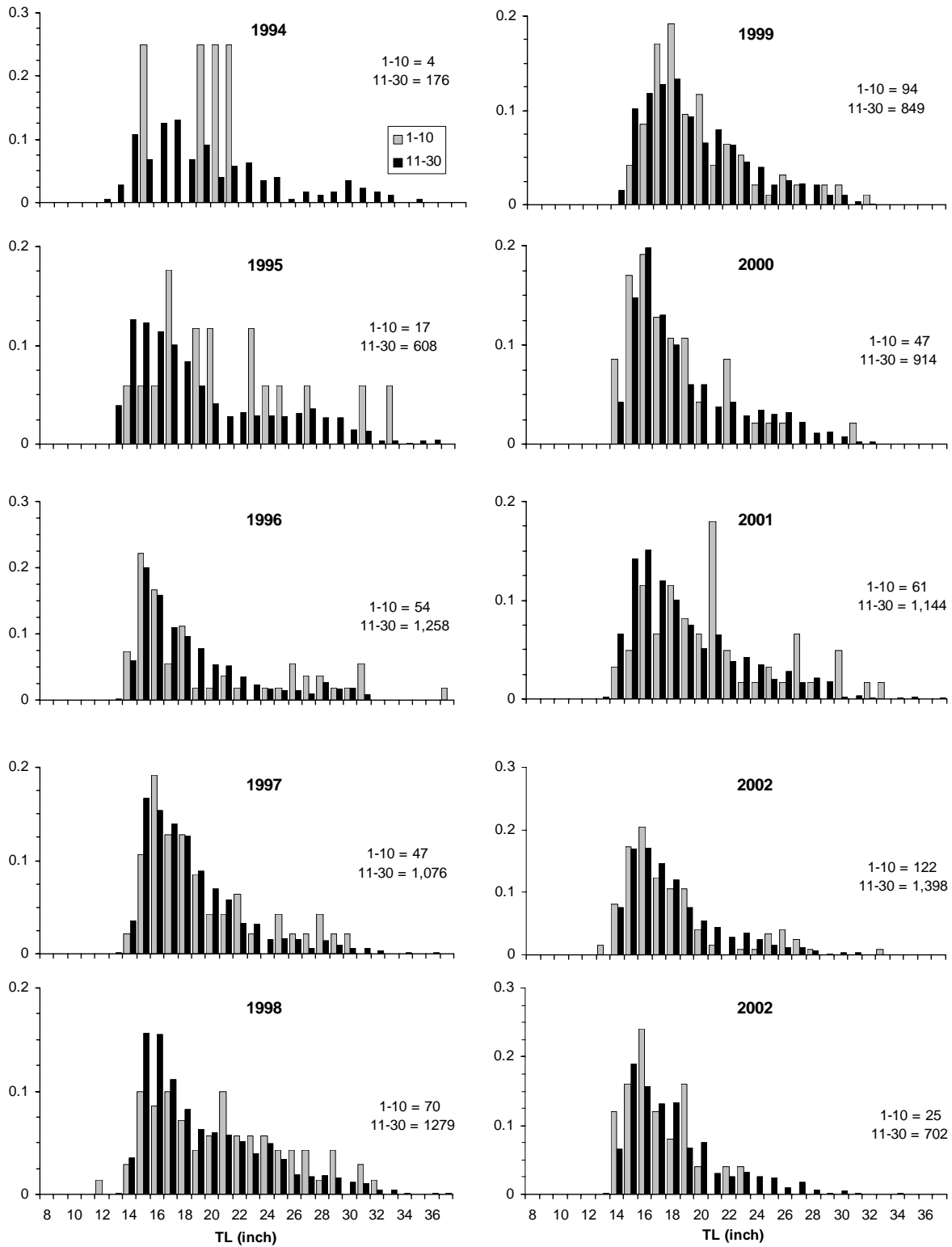


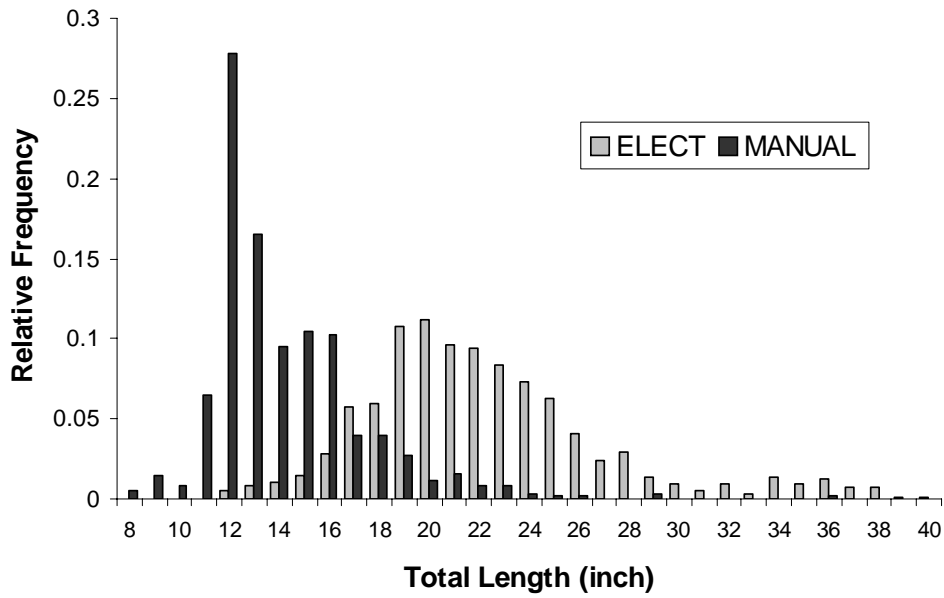
Figure 9: Relative size frequency distribution of red snapper from samples with less than 10 animals (black bars) and 11-30 animals (grey bars) for all grid cells combined from 1984 to 2002. Sample sizes are provided in each graph.

Figure 9 (continued)



a)

1984-1988



b)

1989-2002

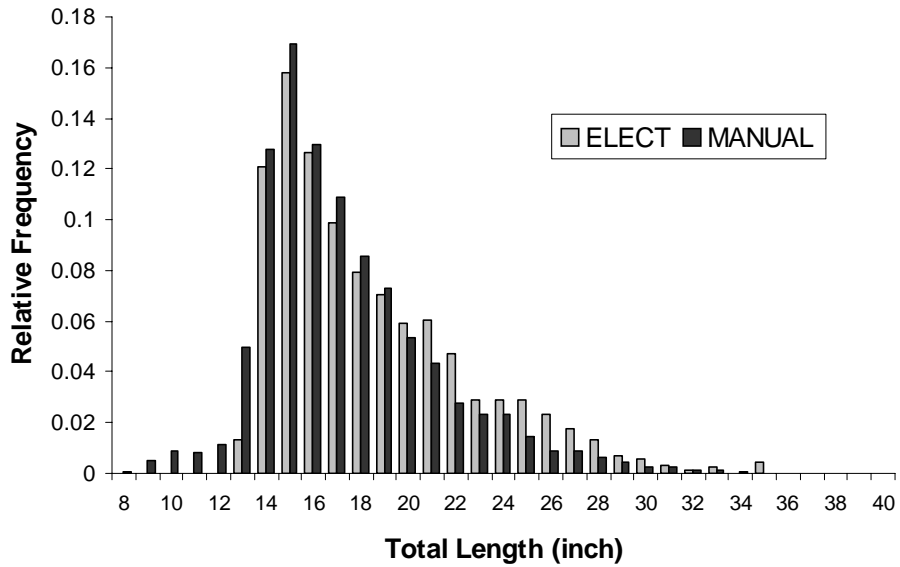


Figure 10: Size frequency distribution of red snapper sampled on the east GOM harvested with electric (ELECT) and manual (MANUAL) gear from a) 1984 to 1988 and b) 1989 to 2003.

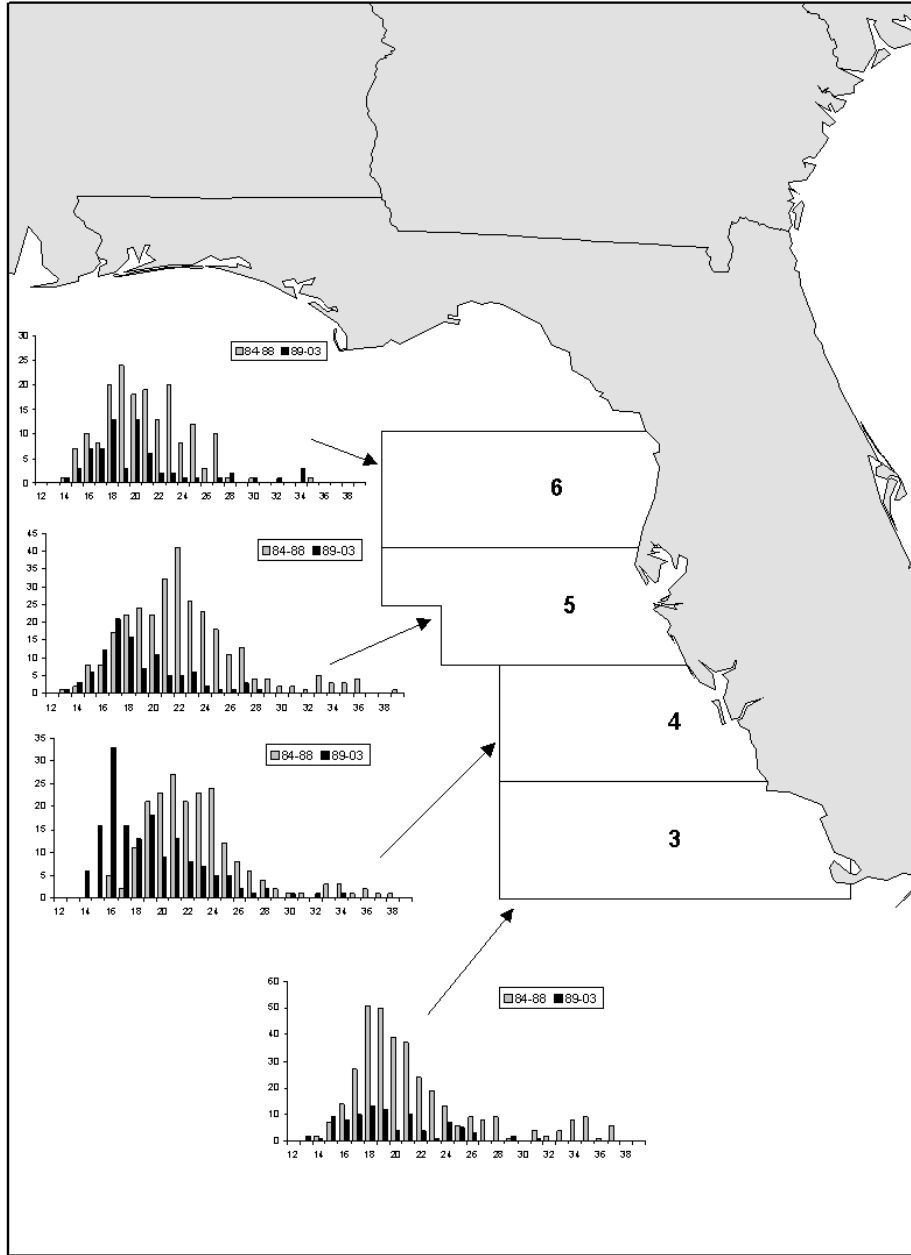


Figure 11: Size frequency distributions of red snappers caught by electric gear in grid cells 3-6 during the periods 1984-1988 and 1989-2003.

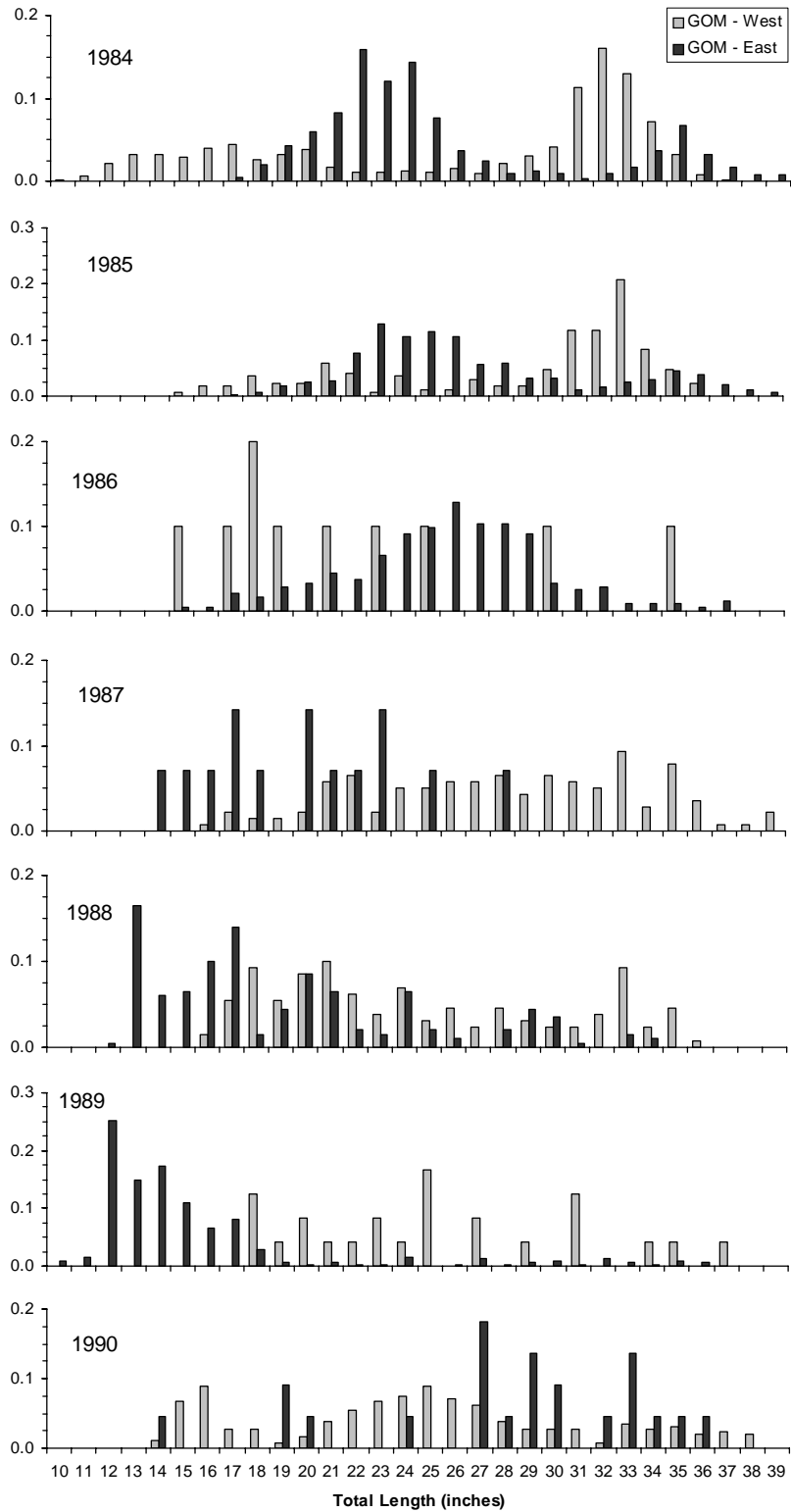


Figure 12: Size frequency distribution of red snapper caught by longline gear (LL) and sampled by TIP from 1984 to 2003

Figure 12 (continued)

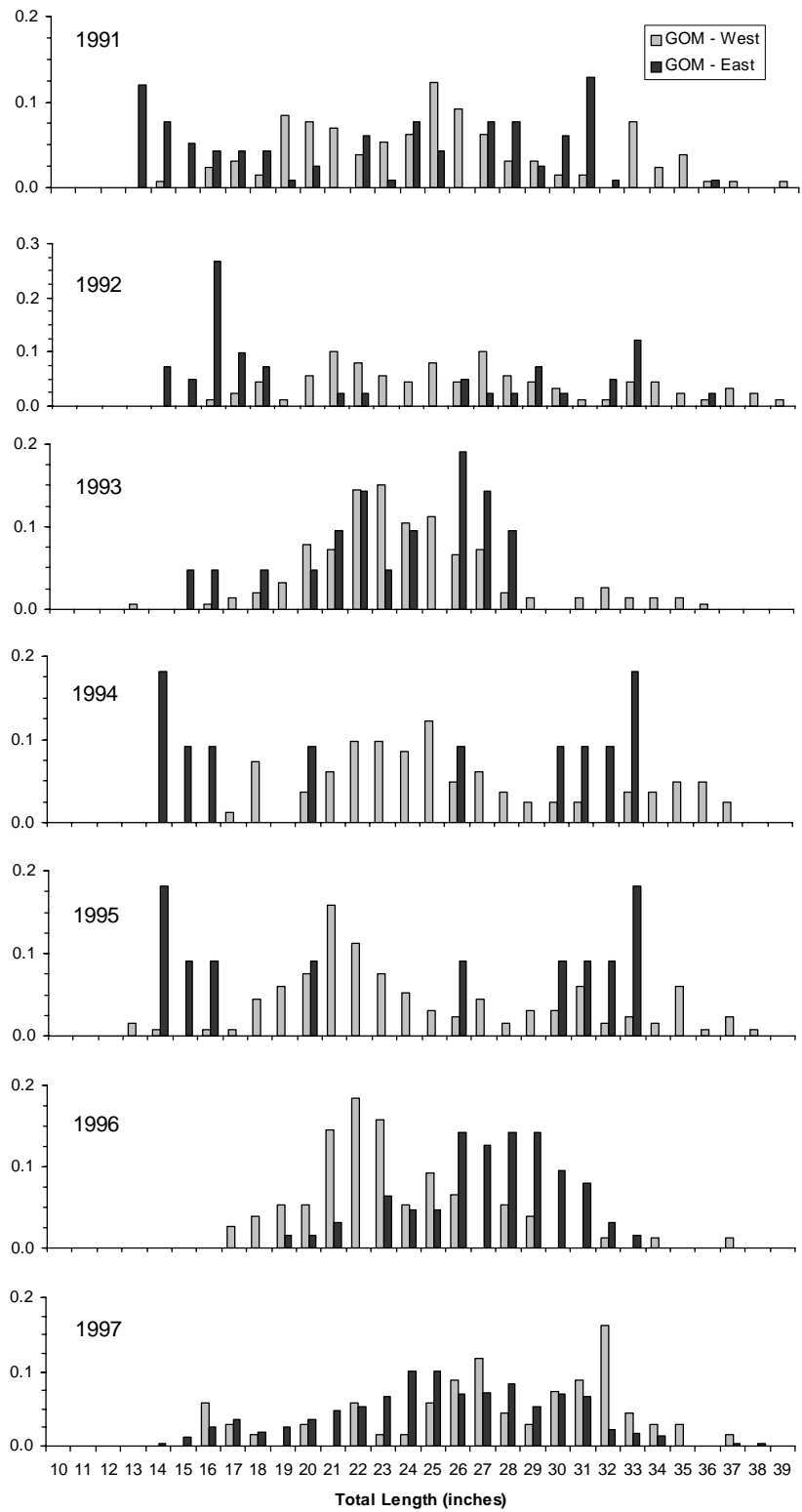


Figure 12 (continued)

